DOCUMENT RESUME

ED 310 326 CG 021 902

AUTHOR Crider, Raquel A., Ed.; Rouse, Beatrice A., Ed.
TITLE Epidemiology of Inhalant Abuse: An Update. NIDA Research Monograph 85.
INSTITUTION National Inst. on Drug Abuse (DHHS/PHS), Rockville, Md.
REPORT NO DHHS(ADM)-88-1577
PUB DATE 88
NOTE 217p.
PUB TYPE Collected Works - General (020) -- Reports - General (140)

EDRS PRICE MF01/PC09 Plus Postage.
DESCRIPTORS *Adolescents; American Indians; Behavior Problems; Chemical Analysis; *Drug Abuse; *Drug Addiction; Hispanic Americans; Minority Groups; Peer Influence; Pharmacology; Poisons; Sociocultural Patterns; *Substance Abuse
IDENTIFIERS *Inhalant Abuse; National Institute on Drug Abuse

ABSTRACT

This publication consists of papers and discussion from a comprehensive RAUS (Research Analysis and Utilization System) review focusing on factors relating to a multi-year increase in inhalant abuse among high school seniors. The document contains the following articles: (1) "Inhalant Overview" (Raquel A. Crider and Beatrice A. Rouse); (2) "Current Topics in Inhalant Abuse" (Karen Kerner); (3) "Inhalant Abuse by Young Children" (Fred Beauvais and E. R. Oetting); (4) "Indian Youth and Inhalants: An Update" (Fred Beauvais and E. R. Oetting); (5) "Inhalant Abuse in a Small Rural South Texas Community: A Social Epidemiological Overview" (Alberto G. Mata, Jr. and Sylvia Rodriguez Andrew); (6) "The Continuing Problem of Youthful Solvent Abuse in New York State" (Blanche Frank, Rozanne Marel, and James Schmeidler); (7) "Program Experiences with the Solvent Abuser in Philadelphia" (Terence M. McSherry); (8) "Inhalant Use and Abuse in Canada" (Reginald G. Smart); (9) "Epidemiology of Solvent/Inhalant Abuse in Mexico" (Elena Medina-Mora and Arturo Ortiz); and (10) "Social and Psychological Factors Underlying Inhalant Abuse" (E. R. Oetting, Ruth W. Edwards, and Fred Beauvais). A list of National Institute on Drug Abuse research monographs is appended. (TE)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED310326

CG

National Institute on Drug Abuse

Research 85

MONOGRAPH SERIES

RAUS

RESEARCH ANALYSIS and UTILIZATION SYSTEM

Epidemiology of Inhalant Abuse: An Update

CG 021902

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

U. S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service • Alcohol, Drug Abuse, and Mental Health Administration

BEST COPY AVAILABLE

Epidemiology of Inhalant Abuse: An Update

Editors:

Raquel A. Crider, Ph.D.
Beatrice A. Rouse, Ph.D.

Division of Epidemiology and Statistical Analysis
National Institute on Drug Abuse

NIDA Research Monograph 85
1988

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Alcohol, Drug Abuse, and Mental Health Administration

National Institute on Drug Abuse
5600 Fishers Lane
Rockville, Maryland 20857

NIDA Research Monographs are prepared by the research divisions of the National Institute on Drug Abuse and published by its Office of Science. The primary objective of the series is to provide critical reviews of research problem areas and techniques, the content of state-of-the-art conferences, and integrative research reviews. Its dual publication emphasis is rapid and targeted dissemination to the scientific and professional community.

Editorial Advisors

MARTIN W. ADLER, Ph.D.
Temple University School of Medicine
Philadelphia, Pennsylvania

SYDNEY ARCHER, Ph.D.
Rensselaer Polytechnic Institute
Troy, New York

RICHARD E. BELLEVILLE, Ph.D.
NB Associates, Health Sciences
Rockville, Maryland

KARST J. BESTEMAN
Alcohol and Drug Problems Association
of North America
Washington, D.C.

GILBERT J. BOTVIN, Ph.D.
Cornell University Medical College
New York, New York

JOSEPH V. BRADY, Ph.D.
The Johns Hopkins University School of
Medicine
Baltimore, Maryland

THEODORE J. CICERO, Ph.D.
Washington University School of
Medicine
St. Louis, Missouri

MARY L. JACOBSON
National Federation of Parents for
Drug-Free Youth
Omaha, Nebraska

REESE T. JONES, M.D.
Langley Porter Neuropsychiatric Institute
San Francisco, California

DENISE KANDEL, Ph.D.
College of Physicians and Surgeons of
Columbia University
New York, New York

HERBERT KLEBER, M.D.
Yale University School of Medicine
New Haven, Connecticut

RICHARD RUSSO
New Jersey State Department of Health
Trenton, New Jersey

NIDA Research Monograph Series

CHARLES R. SCHUSTER, Ph.D.
Director, NIDA

THEODORE M. PINKERT, M.D., J.D.
Acting Associate Director for Science, NIDA

Parklawn Building, 5600 Fishers Lane, Rockville, Maryland 20857

Epidemiology of Inhalant Abuse: An Update

ACKNOWLEDGMENT

This monograph is based upon papers and discussion from the RAUS review on the epidemiology of inhalant abuse which took place on September 30 and October 1, 1986, at Rockville, Maryland. The review meeting was sponsored by the Office of Science and the Division of Epidemiology and Statistical Analysis, National Institute on Drug Abuse.

COPYRIGHT STATUS

The National Institute on Drug Abuse has obtained permission from the copyright holders to reproduce certain previously published material as noted in the text. Further reproduction of this copyrighted material is permitted only as part of a reprinting of the entire publication or chapter. For any other use, the copyright holder's permission is required. All other material in this volume except quoted passages from copyrighted sources is in the public domain and may be used or reproduced without permission from the Institute or the authors. Citation of the source is appreciated.

Opinions expressed in this volume are those of the authors and do not necessarily reflect the opinions or official policy of the National Institute on Drug Abuse or any other part of the U.S. Department of Health and Human Services.

The U.S. Government does not endorse or favor any specific commercial product or company. Trade, proprietary, or company names appearing in this publication are used only because they are considered essential in the context of the studies reported herein.

DHHS publication number (ADM)88-1577
Printed 1988

NIDA Research Monographs are indexed in the Index Medicus. They are selectively included in the coverage of American Statistics Index, BioSciences Information Service, Chemical Abstracts, Current Contents, Psychological Abstracts, and Psychopharmacology Abstracts.

PREFACE

The Research Analysis and Utilization System (RAUS) is designed to serve four functions:

- Collect and systematically classify the findings of all intramural and extramural research supported by the National Institute on Drug Abuse (NIDA);
- Evaluate the findings in selected areas of particular interest and formulate a state-of-the-art review by a panel of scientific peers;
- Disseminate findings to researchers in the field and to administrators, planners, instructors, and other interested persons;
- Provide a feedback mechanism to NIDA staff and planners so that the administration and monitoring of the NIDA research program reflect the very latest knowledge gleaned from research in the field.

Since there is a limit to the number of research topics that can be intensively reviewed annually, a few subjects are chosen each year to undergo a thorough examination. Distinguished scientists are invited to participate. Each scientist is provided reports from NIDA-funded research and asked to add information derived from the literature and his or her own research and prepare a comprehensive state-of-the-art review paper on the assigned topic. These papers, together with an overview and discussions make up a RAUS Review Report in the NIDA Research Monograph series.

"Epidemiology of Inhalant Abuse: An Update" was selected as a subject for a comprehensive RAUS review in 1986 to focus on the factors related to the multi-year increase in inhalant abuse among high school seniors. The papers on which the review is based are presented in this monograph.

Drs. Raquel Crider and Beatrice Rouse served as the scientific moderators of the meeting. The overview provides a summary of the individual papers and the discussion which took place at the meeting. Jacqueline P. Ludford, Chief, Research Analysis Branch, Office of Science, is the RAUS coordinator for NIDA.

CONTENTS

Preface v

Inhalant Overview
Raquel A. Crider and Beatrice A. Rouse 1

Current Topics in Inhalant Abuse
Karen Kerner 8

Inhalant Abuse by Young Children
Fred Beauvais and E.R. Oetting 30

Indian Youth and Inhalants: An Update
Fred Beauvais and E.R. Oetting 34

Inhalant Abuse in a Small Rural South Texas Community: A Social Epidemiological Overview
Alberto G. Mata, Jr., and Sylvia Rodriguez Andrew 49

The Continuing Problem of Youthful Solvent Abuse in New York State
Blanche Frank, Rozanne Marel, and James Schmeidler 77

Program Experiences with the Solvent Abuser in Philadelphia
Terence M. McSherry 106

Inhalant Use and Abuse in Canada
Reginald G. Smart 121

Epidemiology of Solvent/Inhalant Abuse in Mexico
Elena Medina-Mora and Arturo Ortiz 140

Social and Psychological Factors Underlying Inhalant Abuse
E.R. Oetting, Ruth W. Edwards, and Fred Beauvais 172

List of NIDA Research Monographs 204

Inhalant Overview

Raquel A. Crider, Ph.D., and Beatrice A. Rouse, Ph.D.

Inhalant use by high school seniors has increased steadily at a time that most other drug use has declined. Annual inhalant use, for example, increased from 4.3 percent in 1983 to 6.9 percent in 1987. In contrast, annual marijuana use declined from 42.3 percent in 1983 to 36.3 percent in 1987 (Johnston 1988). Annual use among youth in the National Household Survey of Drug Abuse also increased from 2.9 percent in 1972 to 4.6 percent in 1979 and 5.0 percent in 1985 (NIDA 1988). Yet, perhaps because inhalant abuse is often thought to be confined to special populations or because the prevalence is low compared to other drugs of abuse, this increase has gone practically unnoticed.

This monograph seeks to highlight the problem of inhalant abuse, identify the populations at risk, and discuss various approaches for control, prevention, and intervention. Chapters in the volume were prepared by participants in a Research Analysis and Utilization System (RAUS) review held by the National Institute on Drug Abuse in the fall of 1986.

Inhalants can be grouped into four classes: (1) volatile solvents such as glue, gasoline, and paint thinner, (2) aerosols such as spray paints, (3) anesthetics such as ether, chloroform, and nitrous oxide, and (4) amyl and butyl nitrite. The volatile solvents, aerosols, and anesthetics are the primary focus of this volume.

Data in the monograph clearly document the seriousness of the problem. Initial use of inhalants starts very young, sometimes

preceding the initial use of alcohol or tobacco. Research suggests that youth who begin with inhalants are more likely to continue to serious levels of drug involvement than those whose first drug is marijuana. From a geographic perspective, the highest prevalence is found in relatively isolated communities such as Indian reservations or small Hispanic communities.

More important than the geographic differences in this country, however, are the similarities in time series trends between countries. Paralleling the increase in the United States is the rising prevalence in Mexico and some parts of Canada. These trends suggest an underlying phenomenon driving increased use in all three countries.

Each chapter in the monograph focuses on a different aspect of the problem. The first chapter provides an international and theoretical framework, while the next five chapters are devoted to various special populations. Five special populations are considered: young children under age 12, American Indian youth, teenagers in a small rural Hispanic community, secondary students in New York State, and adult inhalant abusers in inner-city Philadelphia. To afford a comparison for trends in the United States, studies from Canada and Mexico follow. Finally, the last chapter summarizes the psychological and sociological aspects of the problem.

Kerner writes about inhalant abuse as a world-wide problem, citing the variety of approaches to prevention and control measures. Although many countries experience similar use patterns, control measures range from limiting supply to adding irritating substances to the substance being abused as an inhalant. According to Kerner, these control measures sometimes lead to unintended and undesirable consequences.

Beauvais and Oetting, in their chapter on inhalant abuse by young children, report lifetime prevalences of inhalant use ranging from 5 to 15 percent among young children. Approximately half of those who try inhalants show signs of continuing use. Their results suggest there may be significant inhalant experimentation by children under the age of 12. Because few studies include this age group, however, little is known about the correlates, causes, or long-term consequences of this behavior in young children.

In their chapter on the American Indian population, Beauvais and Oetting present data from their ongoing epidemiologic study of drug use among youth on Indian reservations which they have conducted since 1975. Inhalant rates among 4th through 12th grade Indian students are presented. Lifetime inhalant use among 12th grade Indians was two and one half times that among non-Indian 12th graders between 1983 and 1984. However, this prevalence among Indian youth declined to a level approximately that of non-Indians by 1985. Epidemiologic research investigating the correlates of the decline is needed and would be important to the design of prevention and control efforts in the Indian population.

Inhalant abuse in a Southwest Hispanic community is discussed in detail by Mata and Andrew. A survey of 6th to 12th graders shows early onset of drug use. Of those using inhalants, four out of five report their initial experience occurred on or before their fourteenth birthday. When comparing onset of inhalant use to other drugs, the first use of inhalants precedes use of other drugs, including tobacco, alcohol, marijuana and amphetamines. Inhalant patterns of use, availability, and reasons for use are also presented. Mata's findings are even more important if viewed in terms of the possibility of progression to the other drugs.

Frank et al. present data from a survey of 7th through 12th graders in New York State which indicates an ever-increasing prevalence rate parallel to the national trend. Whereas 1.9 percent of students in 1974-1975 reported use in the 6 months prior to the survey, 10.6 percent reported such use by 1983. Furthermore, they found that inhalant users had poor academic performance at all grade levels. For example, one-third of those with a failing grade in 1983 were recent inhalant users. Furthermore, the less family cohesion or closeness perceived, the more likely the student used inhalants recently. Although prevalence of inhalant abuse differed by ethnicity, the effect of ethnicity also differed by residence inside or outside New York City. Among New York City residents, prevalence was highest for white non-Hispanic students. Among those outside the city, prevalence was highest among Hispanic students. More than one in five Hispanics outside the city used solvents for "kicks" or a "high" in the 6 months prior to the survey. Future studies on the interaction between area of residence and ethnicity may shed light on the causes of high prevalence in some communities.

An adult group particularly susceptible to inhalant abuse was studied by McSherry, who describes a drug abuse treatment population in the Kensington-Fishtown area in Philadelphia. He presents a typology of the solvent abusers, describes their family functioning and the group behavior of solvent use, and indicates their physical and mental condition on admission. In addition to presenting a profile of the typical chronic solvent abuser, McSherry indicates the implications of this profile for treatment programs. Most of the clients are adult white males with a 10th grade education or less, and minimal job skills. The inner city Philadelphia treatment population is similar to the inhalant-using patients seen in emergency room visits reported by the Drug Abuse Warning Network (DAWN).

Although data from the various surveys show that the typical abuser is a young teenager, inhalant-abusing emergency room patients are concentrated among 20-29 year-olds (DAWN 1986). Inhalant abusers seen in emergency rooms are predominantly adult males. A substantial portion of these adults also use other drugs (NIDA 1986). Thus the dominance of the emergency room data by adult males may reflect years of exposure or the adverse effect of combinations of drugs rather than the size of the adult population in the prevalence pool.

Smart, from Canada, reports on increasing lifetime use for students in Vancouver. Lifetime prevalence more than doubled from 8.8 percent in 1970 to 19.2 percent in 1982. Use in the 6 months prior to the survey increased from 3.9 percent in 1974 to 6.2 percent in 1982, although the study shows a peak in 6-month prevalence in 1976. In Canada, as in the United States, little attention is given to inhalant abuse in the youthful population, in part because prevalence of inhalants is overshadowed by other, more widely abused substances.

Smart is quick to point out that prevalence of inhalant abuse in Canada is not uniform. For example, the Indian village of Shamattawa has a serious inhalant problem, while York Landing does not. This difference persists, although the two communities are only a few miles apart and the residents of York Landing were once part of the Shamattawa group. In one systematic empirical study of non-Indian communities in 1984, the highest rates of inhalant use were found in communities with few social assets and undergoing rapid acculturation changes. Similar research in the

United States may shed light on the factors influencing high prevalence of inhalant abuse in this country.

Increasing trends of inhalant abuse are noted in Mexico, just as they are in the United States and parts of Canada. Medina-Mora and Ortiz report more than a fourfold increase in lifetime prevalence among 14-18 year-old students, from 0.8 percent in 1976 to 4.4 percent in 1986. The similar increasing trends for the three major North American countries lead one to question the underlying mechanism for the increase. The explanations may lie in the changing character of products available to youth, the changing interest in experimenting with drugs, or some other factor common to all three countries.

Solvent abuse is frequently observed among minors working in the streets of Mexico City. In 1982 a study was undertaken to estimate the prevalence of solvent abuse in this population. In a sample of 329 minors, 95 percent were males ranging in age from 6 to 18 years. Excluding alcohol and tobacco, inhalants were most commonly used, with 27 percent reporting ever use, 22 percent reporting daily use and 9 percent reporting use 4 or more times a day.

To summarize current literature on the effects of inhalant abuse, Oetting et al. discuss the social and psychological effects underlying inhalant abuse. According to the authors, inhalant abusers are grouped into three main types: inhalant-dependent adults, polydrug users, and young inhalant users. Adult inhalant users consist of long-term drug and alcohol users for whom inhalants are the drug of choice. McSherry describes this group from a clinical perspective in his chapter. Polydrug users are typically adolescents who use several drugs and whose drug use plays a major role in their activities. Some of the data from the DAWN emergency room system and school surveys reflect this group. The young inhalant users are defined as those using inhalants and no other drug except alcohol and/or marijuana. Many of the young American Indians and other young inhalant users in school are typical examples.

Oetting et al. also discuss factors that increase susceptibility to inhalant abuse. These include the effects of age, gender, ethnicity, peers, community, family, deviance, school adjustment, social adjustment, and education problems. They found more emotional problems among young inhalant users. For example, the

young inhalant users reported more anxiety, depression, and anger than young marijuana users or non-drug users. Finally, Oetting and his colleagues describe the "peer cluster theory" relating to adolescent drug use. According to the theory a wide range of social and psychological factors make an individual susceptible to drug use. However, when drug use actually occurs, it almost always occurs as a reflection of the peer cluster. Friends and siblings provide access to drugs and teach the youth how to use drugs. When youth who are best friends or members of small gangs form a drug-using peer cluster, they share their beliefs and ideas, generate the rationale that the group will use to decide where and when drugs will be taken, and decide what drugs will be used. Most drug use then takes place within the context of the peer cluster.

In conclusion, three main issues underlie the presentations in this volume. First, inhalant abuse is increasing not only in the United States but in neighboring countries. These trends are often overlooked, in part because year-to-year changes are not statistically significant, although multi-year changes are.

Second, prevalence differs greatly by subgroup. Examples of high prevalence subgroups are: Hispanics in a Southwest rural community, Hispanics outside New York City, American Indians on reservations, and White youth and young adults in an economically disadvantaged neighborhood in Philadelphia.

Third, inhalant abusers can be grouped into three categories; inhalant-dependent adults, polydrug users, and young inhalant users. Thus, the true challenge of prevention efforts is tailoring the approach to the differing target populations. In this regard the concepts contained in this monograph represent a structure upon which to build future work.

REFERENCES

Drug Abuse Warning Network. Special tabulations of inhalant-related emergency room mentions in 1986, excluding amyl and butyl nitrite, prepared by Betsy Slay, Division of Epidemiology and Statistical Analysis, National Institute on Drug Abuse.

Johnston, L.D., O'Malley, P.M., and Bachman, J.G. National Trends in Drug Use and Related Factors Among American High

School Students and Young Adults, 1975-1986 DHHS Pub. No. (ADM)86-1535. Washington, DC: Supt. of Docs., U.S. Govt. Print. Off., 1987.

National Institute on Drug Abuse. Statistical Series I, Number 6. Annual Data 1986, Data from the Drug Abuse Warning Network. DHHS Pub. No. (ADM)87-1530. Rockville, MD: The Institute, 1987.

National Institute on Drug Abuse. 1985 National Household Survey on Drug Abuse, Division of Epidemiology and Statistical Analysis: Rockville, MD: The Institute, 1988.

AUTHORS

Raquel A. Crider, Ph.D.
Beatrice A. Rouse, Ph.D.

Division of Epidemiology and
Statistical Analysis
National Institute on Drug Abuse

Current Topics in Inhalant Abuse

Karen Kerner, Ph.D.

The nonmedical use of inhalants, particularly by the young, has become a health problem of increasing concern to numerous countries. Japan (Suzuki et al. 1974; Sasa et al. 1978), Sweden (Anggard 1980; Hibell and Jonsson 1977; Sennerfeldt 1978), Denmark (Kringsholm 1980), Finland (Alha et al. 1973), Mexico (Gutierrez et al. 1978; Moiron 1977), Nigeria (Pela and Ebie 1982), South Africa (Moosa and Loening 1981; Lalloo et al. 1981), Poland (Przyblowski et al. 1978), Bulgaria (Perkova 1975), Ireland (Kirke et al. 1971), Rhodesia (Buchan 1975), Italy (Bressa and Besani 1976), France (Braconnier 1976; Calvet, personal communication, 1987), Malaysia (Navaratnam et al. 1979), India (Vatma and Dan 1980), Australia (Baume 1970; Commonwealth Department of Health 1984a, 1984b, 1984c), Scotland (Watson 1985), England (O'Connor 1983; National Children's Bureau 1986), Wales (National Children's Bureau 1986), Germany (Altenkirch et al. 1977), Norway (Waal 1972), Thailand (Bangkok Post 1981a, 1981b, 1983a, 1983b, 1984, 1986; Feingold, personal communication, 1987), and the United States (particularly for minority populations, e.g., Schottstaedt and Bjork 1977; Dworkin and Stephens 1980; Santos de Barona et al. 1984; Wingert and Fifield 1985; Szapocznik et al. 1977) have all reported increasing levels of inhalant abuse. Inhalants are toxic, legal, plentiful, and easily available; for these reasons, they represent significant present and potential sources of abuse.

Although contemporary concern with inhalants as a source of abuse dates from the immediate post World War II period [Sweden published first reports of sniffing behavior in 1948; the first

American mention--of gasoline sniffing--was published in 1951 (Clinger and Johnson 1951)], the nonmedical use of inhalants has been reported for many parts of the world, in many historical periods. The priestesses at Delphi, as well as religious functionaries in Africa, South America, and Southeast Asia, traditionally utilized forms of snuff, drug powders, and gases, inhaled intranasally, to stimulate trance and/or elevated perception, for religious purposes. During the nineteenth century, ether (Richardson 1879; Hart 1890), chloroform (Crothers 1895; Browning 1885), and nitrous oxide (Robinson 1947) were widely employed as intoxicants in a recreational context prior to their use as analgesics/anesthetics. Indeed, it was this recreational usage that purportedly stimulated physicians of the period, such as Simpson in Britain, to employ anesthetic substances in childbirth and for surgery. These three different uses of inhalants, (considered from the perspective of the user), religious/spiritual, recreational, and medical, are reflected in today's current inhalant practices. Consequently, any reliable prevention or treatment program must provide the means to substitute nonharmful activities that satisfy these users' needs for gratifications sought previously in solvent sniffing.

A MODEL OF INHALANT USE

Mind-altering substances, such as tobacco, alcohol, cannabis, hallucinogenic snuffs, or opium (to name a few), employed religiously, therapeutically, and/or recreationally, have traditionally formed a culturally significant part of social life in virtually all societies. The innocuousness or otherwise of such substances is a product not only of the pharmacological properties characteristic of these substances, but also of the cultural context and structural nexus within which they are employed. Indeed, these substances may be viewed as constituting a distinct and distinctive cultural system, linking substance, user, and occasion of use. From this perspective, the process of labeling certain types of drug use as "licit" or "illicit" and even, to some extent, "harmful" or "harmless," emerges from the operation of cultural rules regulating the interaction of drug, user, and situation of use.

Culture, as used here, refers to the hierarchically structured set of rules which define situations and generate behavior. Within the cultural system of drugs and drug use, social situations (occasions of use) exert an influence on drugs (psychoactive substances) which in turn exert a reciprocal influence on those social

situations. Every occasion of drug use presupposes the interaction of user, substance used, and situation of use; it is impossible to isolate, in the natural setting, the pharmacological effect of a substance from these other elements of context of use. Becker has pointed out that

> Drug effects vary from person to person and place to place because they almost always have more than one effect. People may conventionally focus on and recognize only one or a few of these effects, ignoring the others as irrelevant. . . Thus users are likely to focus on the "beneficial" effects they seek and to ignore others.
>
> When people take drugs, their subsequent experience is likely to be influenced by their ideas and beliefs about the drug. What they know about the drug influences the way they use it, the way they interpret its manifold effects and respond to them, and the way they deal with the aftereffects. Conversely, what they do not know affects their experience, making both certain interpretations and action, based on that missing knowledge, impossible. . .
>
> Side effects are not a medically or pharmacologically distinct category of reaction to drugs. Rather, they are effects not desired either by the user or the person administering the drug. Both side effects and main effects are thus socially defined categories. Mental disorientation might be an unwanted side effect to a physician but a desired main effect to an illicit drug user.
>
> A drug user's knowledge, if adequate, lets him or her identify unwanted side effects and deal with them in a self-satisfactory way. Users concentrating on a desired main effect may not observe an unpleasant side effect or may not connect it with use of the drug. . . (Becker 1980, pp. 180-182).

The cultural system of drugs comprises both models of drug use and models for drug use. By models <u>of</u> (in the anthropological

sense defined by Geertz), we mean descriptions of actual behavior. By models for, we mean prescriptive systems for desired behavior. It is this latter category that comprises both medical and moral models. Both models of and models for nonmedical inhalant use serve as the basis for current responses to the perceived problem of inhalant abuse.

INHALANTS

There are four basic classes of inhalants: 1) volatile solvents, including glue, lighter fuel, paint thinners, degreasing compounds, gasoline and exhaust fumes, and hundreds of preparations in ordinary household and commercial use; 2) aerosols, including hair sprays, deodorants, vegetable frying pan lubricants, spray paints, and hundreds of other items in ordinary household use; 3) anesthetics, including ether, chloroform, and nitrous oxide--the latter is also used as a propellant for whipping cream; and 4) volatile nitrites, including amyl nitrite, used on prescription by heart patients, and butyl nitrite, marketed in room fresheners--both are used recreationally to enhance sexual pleasure.

Whether sniffed (inhaled by nose) or huffed (inhaled by mouth), the different inhalants have a similar intoxicating effect. They can cause disorientation, dizziness, and other effects of intoxication that can be interpreted as euphoric. The resulting period of intoxication after using an inhalant can last anywhere from a few minutes to a couple of hours, and any resulting hangover is reported to be milder than that resulting from use of alcohol. It appears that although many young people try sniffing some substance at least once, most of them abandon the practice after a single experimental try. Those who become chronic users, according to Cohen (1978), do so for the following reasons: peer influence, low cost, easy availability, convenient packaging, mood enhancement, the rapid nature of intoxication, and avoidance of legal hassles.

Volatile solvents and aerosols contain numerous components that have proven toxic, including acetones, benzene, petroleum hydrocarbons, toluene, dichloro- and trichloro-fluoromethanes, and ketones. Toxic neuropathies have been reported as a consequence of solvent sniffing (Prockop 1979) as well as inhalation of nitrous oxide (Layzer et al. 1978). Renal dysfunction (O'Brien et al. 1971) and aplastic anemia (Powars 1965) have been reported consequences of inhalant use, as has liver damage (Litt et

al. 1972; Sourindhrin, personal communication, 1982). Bass (1970) and Reinhardt and coworkers (1971) have described, respectively, 110 and 65 deaths in the United States directly attributed to "sniffing"; Watson (1979) has described 45 sniffing-related deaths in Britain; while Alha and associates (1973) reported 12 sniffing-related deaths in Finland. The 1985 mortality total for Britain with reference to all classes of solvents was 116; for 1986, it was 93 (Re-Solv, n.d.).

For American high school students, Johnston and coworkers (1986:16) reported, "Inhalant use among high school seniors remained fairly steady in 1985, and, in fact, has changed rather little since 1980. Adjusted annual prevalence in the senior year of high school is 7.2 percent. The amyl and butyl nitrate component of that general class of drugs also remained stable with annual prevalence of 4.0 percent (which is below peak levels in earlier years).

Padilla and associates (1979) have reported that inhalant use by Mexican-American youths is 14 times more likely in the barrios, with 25 percent of those surveyed reporting the use of inhalants at least once. Similarly, inhalant abuse has been reported to be high among Native American youths in the United States (Oetting et al. 1980). A 30 percent lifetime prevalence rate has been reckoned for reservation youths (Goldstein et al. 1979). A use rate of 10 percent has been reckoned for the at-risk population in Scotland (Watson, personal communication, 1985). The reported age range for most sniffers is between 7 and 17 years. In short, although there is some indication (Cohen 1978, p. 9) that the number of users over the age of 20 is increasing, the incidence of inhalant use is largely confined to a very young population.

Throughout the world, reported cases of inhalant abuse typify the user as an adolescent male between 13 and 15 years of age. Partial exceptions to this picture are South Africa, where sniffing of benzine is found to be widespread among younger children of both sexes (Lallo et al. 1981), and Australia, where the 1983 Survey of Drug Use by Secondary School Students indicates that girls are more likely to be sniffing than boys (New South Wales Centre for Education and Information on Drugs and Alcohol, 1984). Sniffing practices cut across social and class lines, although in Australia and the United States emergent adolescent subcultural use of inhalants appears to be over-represented in ethnic minority populations. Although early reports focused on purported social

and psychological dysfunction among sniffers, it is clear that distinctions must be made between those who try sniffing on an experimental basis and those who come to the attention of authorities in conjunction with sniffing behavior. The latter class of individuals is more likely to have come to official attention on the basis of a pattern of multiple social dysfunctions. (See, for example, Sennerfeldt 1978.)

DELIBERATE INHALATION VERSUS INDUSTRIAL EXPOSURE

As Watson (1976a) has observed, there are major differences between the deliberate inhalation of solvents and industrial exposure to such. These are quite specific:

1) Industrial vapor emitted during work processes is likely to be composed of a single gas or a known combination of gases; whereas the inhalant abuser tends to inhale a whole range of gases for recreational purposes, neither knowing nor caring what they are.

2) Persons contaminated by gas inhalation during work tend to be adults; inhalant abusers are usually children or youths.

3) Accidental inhalation as a consequence of work processes often occurs over a long period; the deliberate inhaler absorbs a high concentration of vapor often in a very short time, particularly as a consequence of repeated deliberate inhalation.

The maximum allowable concentration of toluene for industrial operations has been set at 200 parts per million. The concentration of toluene achieved during inhalation from a bag containing toluene-based glue has been estimated by the Illinois Bureau of Toxicology to be 50 times this allowable concentration (Press and Done 1967).

THE USER

Why do sniffers sniff? Preble and Laury (1967) referred to glue as "the ten cent hallucinogen," pointing to two of the attractions of inhalants: their cheapness and their ability to induce mood-altering experiences. Young sniffers and ex-sniffers in several countries have told me of their pleasure and excitement--and sometimes their terror--in sharing communally induced hallucinations. This form of intoxication, particularly when experienced within the confines of a group, appears to release both creative and emotional impulses that lend color and excitement to an otherwise drab existence.

For some--and it must be remembered that adolescence is a time of testing established behaviors--sniffing is exciting precisely because it is dangerous. Gregory suggests that British teenagers sniff glue

> because it has been made attractive by the media, it is something that shocks adults, and if you want to offend an adult, a glue bag is a pretty good way of doing it. . . . Although most of us have had the experience of drinking alcohol and of smoking cigarettes, drug taking and solvent misuse are ways in which children can disturb and confuse their parents who don't know what it is about. We have to remember that solvents are a cheap way of getting high.
>
> Obviously, too, for some people they are a pleasurable experience, and while that might shock and disgust us, some young people do find them pleasurable. Young people don't think, 'Oh isn't it terrible I'm having a bad time at school, I'm unemployed, I'll go and sniff,' many do it because there is pleasure in it. (Gregory 1986, p. 10)

Reports from the many countries previously mentioned cite listlessness, apathy, unemployment, difficulties with parents, school problems, and a variety of other prototypic teenage difficulties associated with chronic inhalant use.

Treatment of inhalant abuse requires psychological (Korman 1980), medical (Comstock and Comstock 1980), and neurological (Prockop 1977) examination. Inhalant-dependent patients may require specific medical and psychiatric care. Much further research remains to be done on specific solvent and inhalant toxicities before a uniform system of treatment can be devised.

PREVENTION

A distinction must be made, both theoretically and practically, between efforts made to deal with the treatment of dependent inhalant users and prevention strategies aimed at the nonuser. As one British author has asserted (Ives 1986a, p. 3)

> Prevention strategies should not (must not) be based on experiences with dependent users, because the latter will have attitudes to solvents very different from those of non-users. In tackling the issue of prevention it is easy to forget, but crucially important to remember, that the vast majority of young people are opposed to solvent use.

This latter point is important to remember in conjunction with the contention by another British author (Duncan 1986, p. 21) who says, "solvent misuse is much more a problem of adolescence than it is a problem of 'drug abuse'!"

The prevention of solvent misuse is a highly emotive issue in those countries in which the nonmedical use of inhalants is defined as a social problem. As British authors Didcott and Asquith (1983) put it, "quite apart from the risk of harm to which children who sniff solvents expose themselves there is another, wholly moral dimension to the activity . . . this parallels almost exactly the concerns of those who sought to control the use of drugs in the 1960s." The deviance amplification effect of sensationalist media representations of inhalant abuse (as discussed by Brecher 1972) is frequently adduced by those social researchers who opt for a low-key "casualty reduction" approach to the handling of inhalant abuse as a social issue. Nowhere is the disparity between proponents of casualty reduction or "normalization" (as per the Dutch model of drug control) of inhalant use and what may be termed the abstinence/control model of such use greater than in Britain. The Institute for the Study of Drug Dependence (ISDD) in London suggests that:

> Unfortunately much of what is written on the harmful effects is unreliable and alarmist, tending to ignore distinctions between solvents and to attribute to each and every one of them the combined total of possible ill-effects of them all . . . (Woodcock 1976, p. 1)

The ISDD pamphlet "Teaching about a Volatile Situation" introduces measures constituting a casualty reduction approach (i.e., teaching those who are going to sniff anyway the measures that will lessen dangers). Such information is provided because, as stated,

> We suggest, in summary:
>
> - that prevention of sniffing is not feasible, and that health educators should think about reducing the chances of casualties;
>
> - that the substances most commonly sniffed - glues and especially impact adhesives - are also among the safest. 'Glue sniffing' as such is therefore to be preferred to more indiscriminate solvent sniffing;
>
> - that casualties, which are relatively rare, result more often from circumstances of use than from toxic effects, and could be further reduced by broadly-based health and social education. (Institute for the Study of Drug Dependence 1981, p.4)

TACADE, another British organization concerned with the management of drug abuse, rejects the wholesale implementation of a casualty reduction approach in health education, except "1. If a target group could be identified as being 'habitual/continual' sniffers. 2. It could be shown that these sniffers intend to continue in the practice." (Peers 1982, p. 22). It opts instead for a broad-based low-key general educational "free choice" information approach. The U.K. National Campaign Against Solvent Abuse has, in contrast, opted for widespread publication of dangers associated with inhalant misuse, including sensationalist media coverage, postulating that frightening stories deter more

individuals from habitual usage of inhalants than they attract to such use. These three postures represent in somewhat exaggerated form the stances assumed by prevention agencies in those other countries (primarily Germany, the Scandinavian countries, and the English-speaking countries) which have well-developed education/prevention programs. Australia, for example, employing a combination of casualty reduction and general education approaches, informs health professionals that

1. Total prevention of sniffing is not feasible.

2. Inappropriate solvent use is usually short term. It appears use is more common among adolescent boys who discontinue use as they grow older.

3. Solvent sniffing is not a significant problem when compared with alcohol and tobacco use.

4. Reduction of the chance of casualty is more realistic:

   - Ensure that rooms are well ventilated and air conditioned whilst using any volatile substances. Gas masks are available for major tasks and are used especially in industrial settings.

   - Glues and especially impact adhesives are among the "safest" substances and sniffing of these is of less concern than more indiscriminate solvent sniffing, e.g., sniffing correcting fluid.

   - Casualties, which are relatively rare, result more often from circumstances of use than from toxic effects.

   - Casualties could be further reduced by broadly-based health and social education and promotion programs. (New South Wales Centre for Education and Information on Drugs and Alcohol, 1984, pp. 9-10).

Obviously, individual perspectives greatly influence the choice of prevention strategies in inhalant misuse. Those who work directly in medical or counseling relationships with inhalant users who present themselves for treatment understandably may differ in their advocacy of certain prevention strategies from those who compare the reported magnitude of adolescent inhalant use to other problems--such as drunk driving, teenage pregnancies, and accidents--affecting the young. Much more carefully targeted, culturally specific research is needed to evaluate the utility of one prevention/education approach versus another. It is probable that a mixture of approaches, directed at both users and nonusers, will prove ultimately to be most satisfactory.

EFFECTS

Short-term casual use of certain inhalants, such as glue, appears to be relatively innocuous, provided that the user is in a nondangerous environment. Context of use is particularly important for first-time or experimental users, even if the substance inhaled is pharmacologically less toxic than other solvents commonly misused. For example, an experimental glue sniffer, unfamiliar with the effects and duration of solvent-induced intoxication, is at considerable risk of injury if he or she sniffs near a busy thoroughfare, on an unguarded open roof, or near a railway bridge, particularly if he is alone when he engages in sniffing behavior. As Gregory (1986:13) states,

> Most casualties don't result from the toxic results of the substances themselves, but most often from the circumstances of abuse. Casualties are more likely to occur if people are intoxicated in places that are already dangerous, if people abuse the solvents in a way that is dangerous (e.g., putting plastic bags over their heads, spraying aerosols directly into their mouths), or if people become intoxicated to the extent that they are likely to choke on their vomit. . . . Casualties can also increase when adults use sniffing as a point of contact with young people, if an adult sees sniffing as a cue to have a row with the sniffer . . . . (Gregory 1986, p. 3)

This latter point is significant also in that sniffing behavior may be used as an excuse by adults to assault or sexually abuse young

sniffers. A recent case in the U.K. detailed the defendant's provision of solvents to young boys in order to obtain sexual favors (Watson, personal communication, 1985). Popular newspaper reports from Southeast Asia suggest that inhalants, as well as opiates, are used occasionally in Thailand and the Philippines to intoxicate children of both sexes for the same purpose (Meekhrasabhon, personal communication, 1985).

Other inhalants, such as aerosols, have been reported to induce sudden and fatal cardiac arrest, even on first-time use (Bass 1970; Taylor and Harris 1970a). Recently, deaths have been associated also with typing correction fluid and lighter fluid (see, for example, Ackerly and Gibson 1964; Stuart 1986).

Long-term physical effects of chronic inhalant use are variously reported, with medical experts in many countries still undecided as to whether certain classes of effects may be reversed upon long-term cessation of inhalant use. Thus, for example, King et al. (1981) in Britain conclude that solvent abuse may lead to permanent neurological damage; but Watson (personal communication, 1987) suggests that in all the cases she's studied personally in the last 15 years, no permanent irreversible damage has been demonstrated. (It should be noted that Watson's cases were primarily glue sniffers.) Ron (1986, p. 235), in her review of possible long-term consequences of inhalant abuse, suggests that in the light of "present knowledge, the possibility that permanent structural brain damage, with accompanying psychiatric manifestations, results from solvent abuse remains inconclusive."

Long-term psychological and social effects of dependent inhalant use are even more difficult to evaluate. Moreover, it is nearly impossible to segregate coincident social and psychological problems in users (which may have been causative) from present problems which may be the result of inhalant use. Consideration of social and psychological consequences of inhalant use rests upon evaluation of the four interacting factors previously mentioned, e.g., the user, the substance used, the context of use, and what we have termed the "culture" of use.

CONTROL

Although many States and municipalities in the United States, several cities in Canada, and the United Kingdom and Sweden have enacted legislation to control the provision of inhalants to

persons defined as children (the age limits for this designation vary), it has yet to be demonstrated conclusively that such supply curtailment is either significantly effective or practical and is without unintentional consequences. In several cities of the U.S. and the U.K., tighter controls on the sales of toluene-containing glues to adolescents fostered a shift in use patterns toward greater aerosol and lighter fluid consumption. From the perspective of the health professional, this shift represents the substitution of a more toxic substance for a less toxic one--not a desirable outcome. Moreover age-related legislation imposes a burden on the shopkeeper to decide the age of his or her customer and the purpose to which the purchased substance is to be put.

Perhaps the most puzzling legal attempt to control the sale of inhalants is that found in Scotland, where there exist no specific laws prohibiting such sales. Rather, recent court decisions, framed in the terms of Scottish common law (e.g., Khalia versus H.M. Advocate, 17 Nov. 1983), have been interpreted as prohibiting sales of inhalants to minors "for the purpose of engaging in activities which may lead to bodily harm." Scotland identifies inhalant (there, called solvent) abuse as specific grounds for referral to the juvenile tribunal, the Children's Panel system, although use of inhalants is not illegal. In fact, analysts (e.g., Ashton 1984) of the effects of the Solvent Abuse (Scotland) 1983 Act suggest that the Act is confusing and contradictory and is interpreted and implemented differently in the various regions of the country.

One of the major difficulties of legislation affecting either sale or supply and use of inhalants--leaving aside consideration of the potentially pro-toxic solvent effect of such laws--is simply the enormous variety and availability of solvent-containing products. If sales of gold paint or paint thinner are curtailed, people may choose to use typewriter correction fluid, or shoe polish or nail polish remover, or hundreds of other items that have legitimate uses in everyday life.

Manufacturers in Western Europe, Australia, and the United States have addressed the problem of control from within their own organizations in response to external concerns. Experiments with the addition of foul-smelling or irritating substances (such as oil of mustard) have largely been abandoned because such additions also affected the legitimate users of adhesives and other solvent-containing compounds. Moreover, the addition of noxious

substances may not deter habitual sniffers, who may not interpret their effects as noxious. Certain products have been reformulated to lessen solvent content, insofar as this is consistent with, again, legitimate users' concepts of what a product should be like. Warning labels have been affixed to certain solvent-containing products in Australia, Britain, and the United States, although the majority of these labels may be judged to be too age-specific. Warning labels can also serve to identify the "right" sniffable substances--an undesirable consequence of labeling. The most successful self-regulatory strategies appear to be educational campaigns by solvent and aerosol manufacturing organizations, directed at persuading their own members and salesmen to exercise judgment in the provision of inhalants to the public. Trade publications (for example, Newsagent [U.K.], August 21, 1986) carry articles detailing information about inhalant use and control.

In the absence of definitely workable legislative controls, and in the presence of an enormous variety of solvent-based products which can be employed for inhalation, control of initiation of inhalant use would appear to lie in the hands of educators. As previously noted, educational programs aimed at deterring the nonuser must differ from programs directed at those who habitually misuse solvents. To begin with, much more precise information about the epidemiology of inhalant use, controlled studies of context and frequency, and long-term followups of known clinical cases are all urgently needed.

The extant published literature--which consists primarily of medical case studies--details presenting clinical features of sick individuals, but it does not provide a full picture of what may be termed "naturally occurring inhalant use." (The papers by the other participants in this conference provide a much-needed corrective to this statement.)

Unpublished materials collected from agencies dealing with inhalant users (such use is usually part of a spectrum of presenting problems) are more useful in placing the "problem" of inhalant abuse in context. Although German materials heavily stress abstinent approaches (as is characteristic of official German attitudes toward drug abuse in general), and the sparse French materials call for wider acknowledgment of inhalant use as a problem, the wide variety of materials written by and for health

professionals and teachers in the English-speaking countries stress the utility of a coordinated approach to the problem.

A general consensus exists that some sort of educational program targeted at children and young people in school is necessary, but consensus on its nature has yet to be reached. For example, New South Wales in Australia stresses a low-key, nonalarmist approach, with emphasis on "free choice" education, as do some British organizations. On the other hand, English and Welsh police involved in school liaison work in the larger cities of Britain, and CIB officers in Scotland, provide information about inhalant abuse to children via a more intensely moralistic "shock/horror" approach.

It is certainly difficult to reconcile two such opposed theories of information provision, both of which are felt to be entirely justified by their authors. Only a few studies exist which evaluate the relative merits of the forms in which drug information is provided to schoolchildren, but one Dutch study (de Haes and Schuurman 1975, p. 23) suggests that orienting discussion of drug and inhalant misuse within a larger context of health and attitudinal concerns for teenagers is both more acceptable and more successful than either a specifically targeted factual discussion of drugs/inhalants alone or a shock/horror discussion of drugs/inhalants.

Irresponsible media reporting may well enhance the apparent attractiveness of inhalant use for some young people. Certainly, it can educate them to the properties and practices of inhalant abuse; although (with the exception of Brecher 1972) no comprehensive analysis of the effect of media coverage on inhalant use rates has been conducted, anecdotal evidence from throughout the world suggests a localized rise in incidence following particularly sensationalist documentaries or newspaper reports (the so-called "copycat" phenomenon). Unfortunately, sensationalist reporting is far more common in the most popularly oriented tabloid newspapers, although it is by no means unknown for more conservative journals to pick up and amplify news stories first appearing in the popular press.

Sweden, Japan, Scotland, Australia, Thailand, Mexico, Poland, and Yugoslavia (to name a few) all have developed programs to deal with known sniffers who are introduced to public agencies, although a paucity of funding compromises the extent to which

even imaginative agency responses may be employed. Among techniques utilized are family and individual counseling, group work, more politically oriented social welfare work (particularly in Britain and the Scandinavian countries), and, increasingly, self-help and parent support groups. Although the popularity of the latter may have something to do with cost, in fact, they appear to be particularly useful if they can, in a nonpunitive way, establish or reestablish the basis for good relationships between parents and their children. One of the primary complaints of teenagers throughout the world is that their parents don't understand them; at least in theory, parent-teenager discussion groups which facilitate communication between youths and older people can enhance the development of such understanding.

In summary, inhalant use is a world-wide phenomenon. It appears that this use is becoming more prevalent in industrializing countries (no doubt because of the wider availability of solvents) as well as in fully industrial societies. Certain countries, including Mexico, Australia, and Thailand, report a greatly increased incidence in inhalant use; but whether this is an artifact of improved reporting techniques, short-term fads, or a genuinely worsening endemic situation is unclear. Supply control measures are difficult to implement and may have unintentional and undesired consequences. Media coverage may amplify the perceived problem. Educational measures appear to provide the best approach to control of inhalants for the current nonuser, but disagreements exist in the world literature as to the best form such education should take. It is generally agreed that sniffers with clinical problems require some form of counseling or social support in addition to medical treatment. Self-help groups are perceived to be a useful adjunct to, or substitute for, official agency programs. Considerably more research is needed on the epidemiology of inhalant use, its cultures and its contexts of use, and the circumstances of individual initiation into sniffing--gaps in the literature which the papers at this conference should go a long way to redress.

REFERENCES

Ackerly, W.C., and Gibson, G. Lighter fluid "sniffing". Am J Psychiatry 120:1056-1061, 1964.

Alha, A.; Korte, T.; and Tenhu, M. Solvent sniffing death. Z Rechtsmed 72:299-305, 1973.

Altenkirch, H.; Mager, J.; Stoltenburg, G.; (et al.) Toxic polyneuropathies after sniffing a glue thinner. J Neurol 214:137-152, 1977.

Anggard, E. (Non-medically motivated use of drugs.) (Swedish). Lakartidningen 77(6):423-424, 1980.

Ashton, M. Solvents law in Scotland. Druglink Info Let ISDD, London, Spring 1984, p.16.

Bangkok Post. Thinner addiction rising among poor. 28 Mar 1981a.

Bangkok Post. Addiction to thinner, a growing problem. 17 Sep 1981b.

Bangkok Post. More young people turn to thinner. 4 Jun 1983a.

Bangkok Post. Thinner addiction can be fatal, warns doctor. 16 Jul 1983b.

Bangkok Post. Government urged to act on thinner addicts. 23 Sep 1984.

Bangkok Post. For some, dreams are just a sniff away. 11 Apr 1986.

Bass, M. Sudden sniffing death. JAMA 212(12):2075-2079, 1970.

Baume, P. Patterns of drug abuse in Australia. Med J Aust 1(11):494, 1979. p. 1.

Becker, H.S. The social bases of drug-induced experiences. In: Lettieri, D.J.; Sayers, M.; and Pearson, H.W., eds. Theories on Drug Abuse: Selected Contemporary Perspectives. National Institute on Drug Abuse Research Monograph No. 30. DHEW Pub. No. (ADM) 80-967. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1980. pp. 180-190.

Braconnier, A. Les enfants drogues. CAH Educ Readapt 11(5):167-169, 1976.

Brecher, E.M. Inhalants; solvents and glue sniffing; the historical antecedents of glue sniffing; how to launch a nationwide drug menace. In: Brecher, E.M., and the editors of Consumer Reports. Licit and Illicit Drugs. Boston: Little Brown & Co., 1972. pp. 309-334.

Bressa, G.A., and Besani, G. (Rare toxicomanias. 1. Inhalations of vapors, with a case of dependence on gasoline vapors.) (Italian). Riv Psichiat 11(4):375-384, 1976.

Browning, A.G. A new habit. Med Record 27:452-454, 1885.

Buchan, T. Some aspects of drug abuse in Rhodesia. I. Cent Afr J Med 21(11):235-238, 1975.

Clinger, O., and Johnson, H. Purposeful inhalation of gasoline vapor. Psychoanal Q 25:557-567, 1951.

Cohen, S. Why solvents? In: Sharp, C.W., and Carroll, L.T. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 5-6.

Commonwealth Department of Health, Drugs of Dependence Branch. Abuse of Volatile Substances Information Paper 1. Canberra: Australian Government Publishing Service, 1984a.

Commonwealth Department of Health, Drugs of Dependence Branch. Abuse of Volatile Substances Information Paper 2. Canberra: Australian Government Publishing Service, 1984b.

Commonwealth Department of Health, Drugs of Dependence Branch. Abuse of Volatile Substances Information Paper 3. Canberra: Australian Government Publishing Service, 1984c.

Comstock, E.G., and Comstock, B.S. Medical evaluation of inhalant abusers. In: Sharp, C.W., and Brehm, M.L., eds. Review of Inhalants: Euphoria to Dysfunction. National Institute on Drug Abuse Research Monograph No. 15. DHEW Pub. No. (ADM) 80-533. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1980. pp. 54-80.

Crothers, T.D. Chloroform inebriety: A medico-legal study. N Engl Med Monthly 14:432-435, 1895.

de Haes, W., and Shuurman, J. Results of an evaluation study of three drug education methods. Int J Health Educ XVIII(Suppl)(4):1-16, 1975, p. 19.

Didcott, P., and Asquith, S. The Management of Solvent Abuse: An Exploratory Study. University of Edinburgh, Department of Social Administration, 1983.

Duncan, R. The theory and practice of solvent misuse. In: Ives, R., ed. Solvent Misuse in Context. London: National Children's Bureau, 1986. pp. 17-22.

Dworkin, A.G., and Stephens, R.C. Mexican-American adolescent inhalant abuse: A proposed model. Youth and Society 11(4):493-506, 1980.

Goldstein, G.S.; Oetting, E.R.; Edwards, R.; and Garcia-Mason, V. Drug use among Native American young adults. Int J Addict 14(6):855-860, 1979.

Gregory, S. Countering false images. In: Ives, R., ed. Solvent Misuse in Context. London: National Children's Bureau, 1986. pp. 5-16.

Gutierrez, F. de la Garza; Hernandez, I.M.; and Robago, S. Psychological, familial and social study of 32 patients using inhalants. In: Sharp, C.W., and Carroll, L.T. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 75-89.

220-583 0 - 88 - 2 : QL 3

Hart, E. An address on ether-drinking: Its prevalence and results. Br Med J 2:885-890, 1890.

Hibell, B., and Jonsson, E. Alcohol, drug, tobacco, and sniffing practices among Swedish schoolchildren, 1971-1974. Br J Addict 72(2):117-121, 1977.

Institute for the Study of Drug Dependence. "Teaching about a Volatile Situation: Suggested Health Strategies for Minimizing Casualties Associated with Solvent Sniffing." London, 1981.

Ives, R. Introduction. In: Ives, R., ed. Solvent Misuse in Context. London: National Children's Bureau, 1986a. pp. 1-4.

Ives, R., ed. Solvent Misuse in Context. London: National Children's Bureau, 1986b.

Johnston, L.D.; Bachman, J.G.; and O'Malley, P.M. Highlights from Student Drug Use in America, 1975-1980. Rockville, MD: National Institute on Drug Abuse, 1980.

Johnston, L.D.; O'Malley, P.M.; and Bachman, J.G. Drug Use Among American High School Students, College Students and Other Young Adults--National Trends Through 1985. Rockville, MD: National Institute on Drug Abuse, 1986.

King, M.D.; Day, R.E.; Oliver, J.S.; Lush, M.; and Watson, J.M. Solvent encephalopathy. Br Med J 283:663-665, 1981.

Kirke, P.; Gough, C.; Wilson-Davis, K.; O'Rourke, A.; and Dean, G. Drugs--A Study of Irish Rural Primary Children, 1970-71. Dublin: Med. So. Research Board, 1971.

Korman, M. Clinical evaluation of psychological factors. In: Sharp, C.W., and Brehm, M.L., eds. Review of Inhalants: Euphoria to Dysfunction. National Institute on Drug Abuse Research Monograph No. 15. DHEW Pub. No. (ADM) 80-533. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1980. pp. 30-53.

Kringsholm, B. Sniffing-associated deaths in Denmark. Forensic Sci Int 15(3):215-225, 1980.

Lalloo, M.; Cosnett, J.E.; and Moosa, A. Benzine-sniffing neuropathy. S Afr Med J 59:522-524, 1981.

Layzer, R.B.; Fishman, R.A.; and Schafer, J.A. Neuropathy following abuse of nitrous oxide. Neurology 28:504-505, 1978.

Litt, I.F.; Cohen, M.I.; Schoenberg, S.K. (et al.). Liver disease in the drug using adolescent. J Pediatr 81(2):238-242, .

Moiron, S. The hell of the inhaler. CEMEF Informa Apr 2(4) 1:5-8, 1974, p. 1.

Moosa, A., and Loening, W.E.K. Solvent abuse in black children in Natal. S Afr Med J 59(15):509-510, 1981.

National Children's Bureau. Highlight No. 72: Solvent Misuse. London, 1986.

Navaratnam, V.; Aun, L.B.; and Spencer, C.P. Extent and patterns of drug abuse among children in Malaysia. Bull Narc 31(3-4):59-68, 1979.

New South Wales Centre for Education and Information on Drugs and Alcohol. "Inhalants: A Resource Paper for Health, Welfare and Related Professionals." April 1984.

O'Brien, E.T.; Yoeman, W.B.; and Hobby, J.A.E. Hepatorenal damage from toluene in a "glue sniffer." Br Med J 2:29-30, 1971.

O'Connor, D.J. Glue sniffing and the abuse of solvents by schoolchildren and adolescents. Durham and Newcastle Research Reports 10(Spring):65-71, 1983, p. 1.

Oetting, E.R.; Edwards, R.; Goldstein, G.; and Garcia-Mason, V. Drug use among adolescents of five southwestern Native American tribes. Int J Addict 15(3):439-445, 1980.

Padilla, E.R.; (et al.). Inhalant, marijuana and alcohol abuse among children and adolescents. Int J Addict 14(7):945-964, 1979.

Peers, I.S. "Dealing with Solvent Misuse." Manchester: TACADE, 1982.

Pela, O.A., and Ebie, J.C. Drug abuse in Nigeria: A review of epidemiological studies. Bull Narc 34(3-4):91-99, 1982.

Perkova, M. (A case of gasoline addiction.) (Bulgarian). Saur Med (Sofia) 26(7):35-36, 1975. p. 1.

Powars, D. Aplastic anemia secondary to glue sniffing. N Engl J Med 273(13):700-702, 1965.

Preble, E., and Laury, G.V. Plastic cement: The ten cent hallucinogen. Int J Addict 2(2):271-281, 1967.

Press, E., and Done, A.K. Solvent sniffing: Physiologic effects and community control measures for intoxication from intentional inhalation of organic solvents. Pediatrics 39:451-461, 611-622, 1967.

Prockop, L.D. Multifocal nervous system damage from inhalation of volatile hydrocarbons. J Occup Med 19(2):139-140, 1977.

Prockop, L.D. Neurotoxic volatile substances Neurology 2(6):862-864, 1979.

Przyblowski, J.; Zych, F.; and Padolecki, A. (Effects of chronic experimental intoxication with benzine and ethylene vapors on the pituitary-adrenal system.) (Polish, English summary). Endokrynol Pol 29(5):399-406, 1978.

Reinhardt, C.F.; (et al.) Cardiac arrhythmias and aerosol "sniffing." Arch Environ Health 22:265-279, 1971.

Re-Solv. "Mortalities, Solvent and Volatile Substance Abuse: Number of Deaths in Each County and Standard Region by Year, 1971-86." Table. Stone, Staff. n.d.

Richardson, B.W. "On Ether-Drinking and Extra-Alcoholic Intoxication in a Ministry of Health." London, 1879.

Robinson, V. Victory Over Pain: A History of Anaesthesia. London: Sigma Books, 1974.

Ron, M.A. Volatile substance abuse: A review of possible long term neurological, intellectual and psychiatric sequelae. Br J Psychiatry 148:235-246, 1986.

Santos de Barona, M. (et al.) Inhalant users in drug abuse prevention programs. Am J Drug Alcohol Abuse 10(4):503-518, 1984.

Sasa, M.; Igarashi, S.; Miyazaki, T. (et al.) Equilibrium disorder with diffuse brain atrophy in long-term toluene sniffing. Arch Otorhinolaryngol 221:163-169, 1978.

Schottstaedt, M.F., and Bjork, J.W. Inhalant abuse in an Indian boarding school. Am J Psychiatry 134(11):1290-1293, 1977.

Sennerfeldt, P. Sniffing: Information Till Larare, Socialarbetere, Och Ungdoms Ledare. Stockholm Socialstyrelsen. Namden for Halsoupplvsning, 1978.

Stuart, P. Solvents and schoolchildren--Knowledge and experimentation among a group of young people aged 11 to 18. Health Educ J 45(2):84-86, 1986.

Suzuki, T.; Shimbo, S.; Nishitani, T. (et al.) Muscular atrophy due to glue sniffing. Int Arch Arbetismed (Berlin) 33(2):115-123, 1974.

Szapocznik, J.; Daruna, P.; Scopetta, M.A. (et al.) The characteristics of Cuban immigrant inhalant abusers. Am J Drug Alcohol Abuse 4(3):377-389, 1977.

Taylor, G.J., and Harris, W.S. Cardiac toxicity of aerosol propellants. JAMA 214(1):81-85, 1970a.

Taylor, G.J., and Harris, W.S. Glue sniffing causes heart block in mice. Science 170:866-868, 1970b.

Vatma, V.K.; and Dan, R. Non-medical drug use amongst non-student youth in India. Drug Alcohol Depend 5(6):457-465, 1980.

Waal, H. Kroniske sniffere. Laegeforen 2:701-706, 1972.

Watson, J.M. Glue sniffing. Nurs Times 72:1690-1691, 1976a.

Watson, J.M. The growing problem of glue sniffing. Soc Work Today 8(3):10-11, 1976b.

Watson, J.M. Glue sniffing: A community dilemma. Comm Health 8(3):160-163, 1977a.

Watson, J.M. Solvent Abuse. Unpublished master's thesis, University of Glasgow, 1977b.
Watson, J.M. Glue sniffing in profile. Practitioner 218:255-259, 1977c.
Watson, J.M. Morbidity and mortality statistics on solvent abuse. Med Sci Law 19(4):246-252, 1979.
Watson, J.M. Trends in solvent abuse in Scotland. Med Sci Law 4(2):167-175, 1985.
Wingert, J.L., and Fifield, M.C. Characteristics of native American users of inhalants. Int J Addict 20(10):1575-1582, 1985.
Woodcock, J. Not to be sniffed at? Druglink. London: Institute for the Study of Drug Dependence, Summer 1976 (Rev. 1980).

ACKNOWLEDGMENT

This research was supported by grant DA3252 from the National Institute on Drug Abuse.

AUTHOR

Karen Kerner, Ph.D.
7 Crown Terrace
Glasgow G12 9EZ
Scotland, UK

Inhalant Abuse by Young Children

Fred Beauvais, Ph.D., and E. R. Oetting, Ph.D.

Broad-based epidemiological data on the use of inhalants among younger children are not available. Most large-scale studies of drug abuse focus on youth over age 12, typically above the 6th grade. Where data on inhalants are available below that age, the studies were almost exclusively one-time, from only one location, and were done because someone noticed a local epidemic. For the majority of drugs, emphasis on children over age 12 is appropriate since that is when most drug use takes place. Inhalants, however, are unique in that, due to their availability, they are likely to be one of the first drugs to be abused by young people who are at risk. Most available studies recognize this and, based on age of first use data, conclude that inhalant use prior to age 12 is relatively common.

More so than other drugs, inhalant use seems to occur in episodic outbreaks. A new inhalant is "discovered" and its use rapidly spreads, peaks, and then wanes. Depending at what point in that cycle measures of use are taken, large differences in use can be noted. Since local surveys are often conducted in response to an existing problem, it is possible that many of the one-time surveys reflect drug use near the peak of an outbreak. Thus, use rates are inflated over those that are usually found in a particular population.

Another characteristic of inhalants is that they appear to be used more often in enclaves of disadvantaged populations where there is a larger degree of physical or social isolation. Kaufman (1973), for instance, interviewed children ages 6 to 12 in a southwestern Indian village and found lifetime prevalence rates for inhalant use

of 63 percent. About half of these young people had used inhalants on more than one occasion. Similar findings were reported by Boeckx et al. (1977) in a remote village in northern Canada. Exact rates of use among these children were not obtained, but observers felt it was rare to find young people who did not use inhalants. An extreme example of high inhalant use by young children in Mexico City is reported by Leal et al. (1978). In some areas of the city, there are small, loosely organized groups of street children, often as young as 8 or 9, who left their families to live together in abandoned buildings. They are able to exist through various legal and illegal means and a large part of their day is taken in procuring and using drugs, primarily inhalants since they are cheap (or can be stolen) and readily available.

The above examples are representative of one type of inhalant use among younger children. These instances are highly visible and gain a lot of media and journal attention; and they probably involve a large number of children, within the localized area, in time-limited but significant inhalant use.

Little information is available about other patterns of inhalant use among this age group and, in particular, there are no data to describe what occurs in nonminority populations. The best information in this regard comes from what is known about older inhalant users (see Oetting et al., this volume). The patterns among older students most likely had their genesis prior to age 12, and an understanding of that group would be useful in understanding the younger children. We will have to rely on this inferential knowledge until better studies are available.

Some data do exist regarding the overall rates of inhalant use among younger children. These studies, summarized in table 1, indicate that between 5 percent and 15 percent of young children have experiment with inhalants (i.e., have "ever used"). While the exact patterning of this use is obscure, measures of multiple occasions of use are helpful in determining how many of these younger children can actually be considered "inhalant involved." In the Lerner and Linder study (1974), while 14.4 percent of students reported "ever use" of inhalants, only 3.5 percent reported multiple use within the past year. Using an index that combined recency of use and intention to use in the future, the Western Behavioral Studies report (1981) indicates that 3 percent, just about half, of those who had ever used inhalants were showing

signs of continuing use. The Padilla et al. study (1979) showed a higher rate of continuing use. 8.3 percent of 9- to 12-year-olds having used in the last 2 weeks.

TABLE 1

Lifetime Prevalence Rates for Samples of Young Children

Study	Population	N	% Ever Used
Oetting et al. 1982	Indian 4th-6th Grades	1,538	14.4
Western Behavioral Studies 1981	4th-6th Grades	235	5.6
Lerner and Linder 1974	4th-6th Grades	194	14.4
Epstein and Wieland 1978	9- to 12-year-olds Black Housing Project	110	6.4
Padilla et al. 1979	9- to 12-year-olds Hispanic Housing Project	144	10.4
Schottstaedt and Bjork 1977	Indian 1st-8th Grades	291	12.7

From the available evidence, it appears that a small but important number of 9- to 12-year-olds will experiment with inhalants. An even smaller subset of those, around 3 percent of all youth in that age range, will use inhalants on a continuing basis.

Rates higher than these can certainly be found, but they are likely to occur in scattered instances in isolated populations, often times among minority groups.

The results suggest that there may be significant inhalant experimentation by children younger than 12, particularly minority children. Nothing is known about the correlates of this use. Despite the difficulty of obtaining reliable and valid data on

children who are this young, efforts should be made to determine both the causes and the long-term consequences of this behavior.

REFERENCES

Boeckx, R.L.; Postl, B.; and Coodin, F.S. Gasoline sniffing and tetraethyl lead poisoning in children. Pediatrics 60(2):140-145, 1977.

Epstein, M.H., and Wieland, W.F. Prevalence survey of inhalant abuse. Int J Addict 13(2):271-284, 1978.

Kaufman, A. Gasoline sniffing among children in a Pueblo Indian village. Pediatrics 51(6):1060-1064, 1973.

Leal, H.; Mejia, L.; Gomez, L.; and Salinas de Valle, O. Naturalistic study on the phenomenon of inhalant use in a group of children in Mexico City. In: Sharp, C.W., and Carroll, L.T., eds. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978.

Lerner, S.E., and Linder, R.L. Drugs in the elementary school. J Drug Educ 4(3):317-322, 1974.

Oetting, E.R.; Beauvais, F.; Edwards, R.; Waters, M.; and Velarde, J. Drug Use among Native American Youth: Summary of Findings (1975-1981). Fort Collins: Colorado State University, Western Behavioral Studies, 1982.

Padilla, E.R.; Padilla, A.M.; Morales, A.; and Olmedo, E.M. Inhalant, marijuana and alcohol abuse among barrio children and adolescents. In T J Addict 14(7):945-964, 1979.

Schottstaedt, M.F., and Bjork, J.W. Inhalant abuse in an Indian boarding school. Am J Psychiatry 134(11):1290-1293, 1977.

Western Behavioral Studies. An Analysis of Drug Use in the 4th-12th Grades in the Fort Collins Schools. Unpublished report, Colorado State University, 1981.

ACKNOWLEDGMENT

This research was supported by grant DA-03371 from the National Institute on Drug Abuse.

AUTHORS

Fred Beauvais, Ph.D.
E.R. Oetting, Ph.D.
Department of Psychology
Colorado State University
Fort Collins, Colorado 80523

Indian Youth and Inhalants: An Update

Fred Beauvais, Ph.D., and E. R. Oetting, Ph.D.

Beginning with sporadic reports in the 1970s, concern developed about the level of inhalant use among American Indian youth (Kaufman 1973; Schottstaedt and Bjork 1977; Goldstein et al. 1979). Since that time, we have been able to monitor the trends in inhalant use, as well as trends in the use of other drugs, in this population through a continuing epidemiological study of Indian adolescent drug use (Oetting et al. 1980, 1982; Oetting and Goldstein 1979; Beauvais et al. 1985a; Oetting and Beauvais 1985).

In another publication, we described the patterns of inhalant use among Indian adolescents who were living on reservations from 1975 to 1983 (Beauvais et al. 1985a). This monograph chapter updates the previous data and presents some additional analyses of inhalant use patterns. A brief summary of the findings in 1983 from the previous article will help set the stage for the subsequent discussion:

1. Lifetime prevalence of inhalant use among Indian youth increased gradually from 15 percent to 32 percent between 1975 and 1983. Inhalant use among non-Indians was much lower and did not show an increase across this period of time.

2. There were no appreciable differences between Indian males and Indian females in either lifetime prevalence or recent use. In comparison, non-Indian males used inhalants more often than non-Indian females (Johnston et al. 1985).

3. Inhalants appeared to be used more often by younger students as noted by a decreasing curve: recent use decreased as age increased.

4. Peer encouragement to use inhalants and peer sanctions against use were strongly related to levels of use.

5. Inhalant users were more likely to be also using other drugs.

METHOD

The data for our studies are from anonymous surveys administered during regular school classes to Indian students living on reservations. Absentees and dropouts are not surveyed, nor do we have data for urban Indian adolescents. The survey that is used is highly reliable and valid and has been used with over 12,000 Indian youth and nearly that many non-Indian youth (Oetting et al. 1984).

Each year, we select for surveying a group of reservations or rural communities with large Indian populations that are representative of Indian communities throughout the country. To insure a large enough sample to accurately analyze trends over time, our data are combined in 2-year blocks.

In our previous report on Indian inhalant use, we used a combined sample of 7th to 12th graders to analyze trends in use. At that time, we also compared Indian youth with youth 12-17 years old from the National Institute on Drug Abuse's National Household Survey on Drug Abuse (a periodic nationwide survey) (Fishburne et al. 1980). This comparison group has two limitations. First, it is based on interview data, not anonymous, self-report surveys. This difference in data-collection methods makes direct comparisons difficult. Second, the household survey contained questions on inhalant use only for the period 1974-1979. These questions have recently been reinstated, but this leaves a gap of 6 years in non-Indian data for which trends cannot be analyzed. Data on trends in inhalant use of 7th to 12th grade Indian youth can be obtained from our report (Beauvais et al. 1985b).

In this report, we provide additional data for 1985-86 and provide different comparisons. In order to compare Indian with non-

Indian youth, we use data from the National High School Senior Survey (Johnston et al. 1985). For this comparison, we select only Indian 12th graders. The national survey is conducted annually among high school seniors across the country and uses a methodology very similar to ours. About 16,000 seniors are surveyed each year. The one difficulty with using the senior survey as a comparison is the relatively high dropout rate found among Indian youth. Since it is likely that dropouts have higher rates of drug use (Beauvais and Oetting 1986), the inhalant use rates reported for Indian seniors may be artificially low. To partially compensate for this, we also compare Indian 8th graders with a sample of non-Indian 8th graders that we have surveyed since 1981. The community where the non-Indian data have been collected has had drug use rates close to the national level for the past 5 years, so it should provide an adequate comparison between Indian and non-Indian youth. The sample size for non-Indian 8th grade youth each year is approximately 1,100.

A final sample reported in this paper consists of 4th to 6th grade Indian students. In many of the locations where we survey Indian adolescents, we give a parallel, but simplified, drug use survey to younger students. There are no non-Indian comparative data for this group.

Table 1 shows the Indian sample sizes and the breakdown by sex for the five sampling periods reported in this article.

RESULTS AND DISCUSSION

Trends in Use

Figure 1 shows the trends in lifetime prevalence for Indian and non-Indian students. For both Indian 8th and 12th graders, inhalant use increased from 1975 into the early 1980s--the peak in inhalant use came slightly earlier for the seniors. During the period of highest use, over one-third of Indian youth had at least experimented with inhalants. Since that time, there has been a decrease for both age groups, although the decrease for 8th graders is slight. It is difficult to tell whether this decrease will continue; however, the seniors have shown two consecutive decreases since 1980-81, so a trend may well be established.

FIGURE 1

Trends in Lifetime Prevalence of Inhalant Use for Indian and Non-Indian 8th and 12th Graders

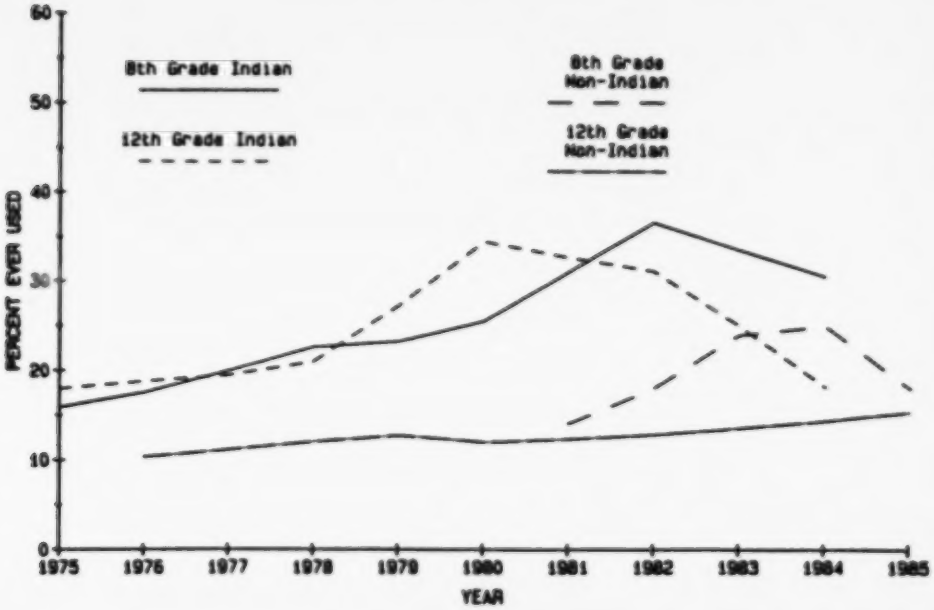


TABLE 1

Size and Sex Distribution of Indian Samples

Survey Year	4th-6th Grades N	%M	%F	8th Grade N	%M	%F	12th Grade N	%M	%F
1975	-	-	-	222	48	52	143	45	55
1977-78	-	-	-	548	48	52	281	52	48
1980-81	1,223	50	50	463	53	47	213	58	42
1982-83	658	52	48	289	50	50	182	52	48
1984-85	1,672	52	48	329	49	51	287	46	54

These recent decreases in lifetime prevalence for inhalants among Indians are consistent with the pattern we have found for other drugs in this population (Beauvais et al. 1985a). Our data on use of other drugs show important decreases for alcohol and marijuana through 1983 and smaller decreases for six other drugs. Even more recent data from our studies (unpublished) indicate that the downward trend is being sustained. If this pattern continues, it may signal a general shift toward lower drug use among Indian adolescents--a pattern that has also been found for non-Indian youth since the early 1980s (Johnston et al. 1985). Although this is cause for optimism, it must be recognized that significant numbers of youth, Indian and non-Indian alike, still use drugs and the drug problem is by no means resolved.

The comparison of Indian and non-Indian youth in figure 1 reveals that Indian youth have consistently higher rates of inhalant experimentation at both age levels. The difference has been particularly large at the senior level where Indian youth have used inhalants at as much as nearly 2.5 times the rate of non-Indian 12th graders. With the drop in Indian inhalant use, however, the gap has lessened considerably in the past 2 years. It is interesting to note that inhalant use among non-Indian seniors has gradually increased each year since 1975. This is an exception to the trend

mentioned earlier of a recent decline in the use of drugs among seniors. Furthermore, it differs from what is found among Indian youth.

The data for recent use of inhalants, shown in figure 2, reveal the same patterns as seen for lifetime prevalence. For the most part, more Indian than non-Indian youth are using inhalants on a continuing basis. It is important to note, however, that recent use is generally much lower than lifetime prevalence. Figure 2 also shows clearly that, for both Indians and non-Indians, inhalants are more likely to be used more often by younger students. Inhalants are unique among drugs of abuse in this respect. Generally, for most drugs (such as marijuana, alcohol, cocaine, and so forth), use will increase with age and use within the past month will always be higher among the older students. The data in figure 2 make it clear that inhalants are preferred by younger children and that use drops off as they get older. Inhalants are also often the first illicit drug to be tried by Indian youth. Table 2 shows the average age of first use for Indian young people for several drugs and the average age of first getting drunk.

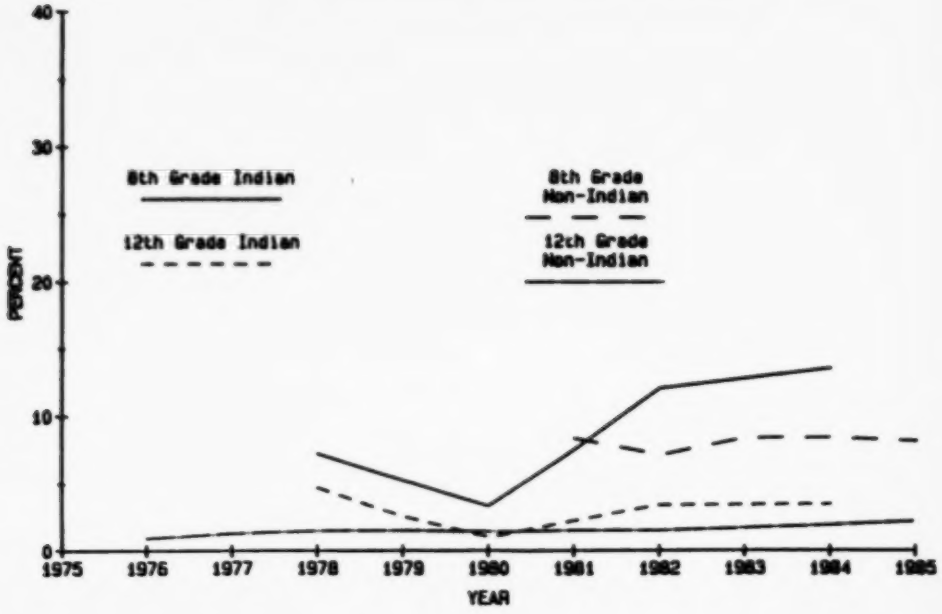
TABLE 2

Average Age of First Use for Cigarettes, Inhalants, and Marijuana, and of First Getting Drunk

Drug	Age of First Use
Cigarettes	11.16
Inhalants	11.92
Marijuana	12.25
Drug Effect	**Age of First Effect**
Getting Drunk	12.56

FIGURE 2

Trends in Last Month Use of Inhalants for Indian and Non-Indian 8th and 12th Graders



One difference between the lifetime prevalence and recent use curves is that, for the 8th graders in particular, recent use has not declined in the past several years as lifetime prevalence has. It is possible that trends in recent use will always lag behind the trends in experimentation. As more youth experiment with inhalants, a certain percentage will go on to use them quite often and perhaps heavily. This group will continue to use at this level even when experimentation in the general population has declined. It remains to be seen whether the number of continuing users will also eventually decline. If this relationship between the number of experimenters and continuing users holds, it will be important information for prevention efforts. It would suggest that experimentation needs to be strongly discouraged since a percentage of all experimenters will go on to heavier use.

The recent use data also give some idea of the seriousness of inhalant use in a population. While not all recent users can be labeled chronic inhalant abusers, the recent used figure provides an upper bound on the number of youth who are seriously involved with these drugs. If someone has not used in the past month, he or she is probably not at much risk due to inhalants. For the most recent reporting period (i.e., 1984-85), less than 15 percent of 8th graders and 4 percent of seniors are placing themselves at some level of risk because of recent inhalant use. It is likely that the number of chronically and seriously debilitated youth is much smaller. The one group that this does not include, however, is school dropouts. Dropouts have higher drug use rates in general (Johnston et al. 1985) and there is reason to believe that inhalant abuse in particular is higher for this group (Annis and Watson 1975).

Use Among Younger Children

It is clear that, by the time Indian youth reach the 8th grade, a significant number of them have already experimented with inhalants. Table 3 shows the rate of lifetime prevalence for three time periods for Indian 4th to 6th graders. About 15 percent of these elementary school students have already had some experience with inhalants. By comparing table 3 with figure 1, it can be seen that this number will double by the 8th grade.

TABLE 3

Percent of Younger Indian Children (4th-6th grade)
Who Have Ever Used Inhalants

	1980-81	1982-83	1984-85
Percent	12.8	14.6	16.8
Total N	1,223	658	1,672

Inhalant use at the earlier ages appears to have consistently increased from 1980 to 1985. While this may be signaling an increase in use in coming years, there is another plausible explanation. Inhalant use increased radically among 12th graders up to 1980 and among 8th graders up to 1982 and subsequently declined. This rapid expansion is probably now working its way down among the younger children and we are seeing a "ripple effect." As use declines among the older children, it is likely that the effect of reduced use will also ripple downward in coming years and, just as we saw a decline 2 years later in the 8th grade, we will begin to see reductions at the elementary school ages in the near future.

Age of First Use

The age pattern for inhalants can be seen more clearly by comparing acquisition curves for inhalants with those curves for alcohol and marijuana (Oetting and Beauvais 1983). Figure 3 shows the three curves. An acquisition curve is constructed by asking youth at each age when they first tried a drug. The points on the curve are a cumulative index of age of first use.

The pattern in figure 3 is very clear. Indian youth begin inhalant use very young, with the ages of the greatest increase in use occurring between 11 and 13 years. After age 13, very few youth will use inhalants for the first time and, by age 16, it is very rare for a young person to even begin experimenting. If use has not occurred by age 13, it likely never will. By contrast, there is considerable first time use of both alcohol and marijuana beyond age 13. In fact, use rates for both drugs rise dramatically up until about age 15. These curves once again confirm the finding that

inhalants are a young person's drug. While some youth will continue to use them into adolescence and adulthood, they began their use very early in life.

Sex Differences

Table 4 shows the percent of Indian males and females at grades 8 and 12 who have ever used inhalants and who have used them in the month previous to the survey. The data in table 4 are for the combined samples from 1975 to 1985.

At the 8th grade level, the males and females are using inhalants at nearly the same rate, although the level for females may be slightly higher. This finding is counter to the stereotype that inhalants are used primarily by young boys. Ten years ago the research emphasized the much higher involvement among young males. Prevention efforts for Indian youth must recognize that young girls have the same potential for inhalant use and abuse as boys.

FIGURE 3

Acquisition Curves for Alcohol, Marijuana, and Inhalants for 9th and 10th Grade Indian Students

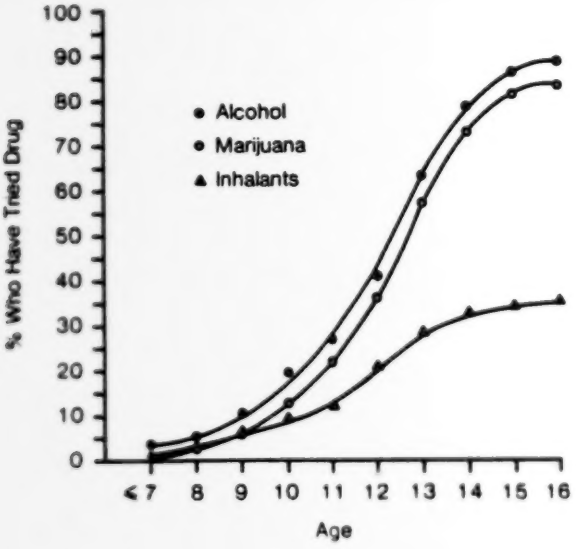


TABLE 4

Percent of Indian 8th and 12th Grade Males and Females Who Have Ever Used Inhalants and Who Have Used Them in the Last Month

	8th Grade		12th Grade	
	Ever Used	Last Month	Ever Used	Last Month
Males	24.8%	7.3%	29.4%	3.8%
Females	28.1%	9.2%	18.7%	2.9%

Among the seniors, there is a distinct difference between males and females, with lower lifetime prevalence and less recent use of inhalants for females. Interestingly, female lifetime prevalence at this age is lower than what was found at the 8th grade level. This seems unusual since the lifetime use measure should not decrease with age--once a person has used a drug, this should always show up on an "ever used" type of question. One possible explanation for this is that Indian girls who use inhalants drop out of school more often and, therefore, they do not show up in the senior sample. The same pattern of lower lifetime use among seniors does not hold for males, however, and there is no evidence for a differential dropout rate for males and females. A more likely explanation is that most females reduce their inhalant use very quickly after the 8th grade. By the time they are seniors, their involvement is very low and they either do not recall their earlier inhalant use or do not consider it a form of drug use. In either case, females are less likely to report it on a drug use survey in their senior year. Males, by contrast, may be continuing their inhalant use through the high school years; therefore, it remains a salient behavior when they are completing a drug survey.

What Inhalants are Used

Nearly any volatile substance, whether it has psychoactive effects or not, will be tried at one time or another by groups of young

TABLE 5

Types of Chemicals Inhaled and the Percent Mentioned for a Sample of Indian 8th and 12th Graders

Gasoline	28.4%
Glue	22.6%
Removers (paint, fingernail polish, etc.)	17.5%
Sprays (mostly paint)	17.1%
Polish (shoe, fingernail, etc.)	6.6%
Other	7.8%

people in an attempt to get high. Our survey provides a place for students to write in the names of substances they have inhaled. The complete list contains over 40 different types of substances; however, five types account for over 92 percent of all of the responses given. Table 5 shows these five types of chemicals and the percent of times they were noted by a large sample of Indian 8th and 12th graders (N = 521). The list and order of preference were identical for 8th and 12th graders. Furthermore, very similar results were obtained for large samples of non-Indian youth. Despite the wide range of substances that can be inhaled, it appears that youth, in general, tend to concentrate on those which are readily available.

Identification of the specific chemicals in readily available commercial products that lead to intoxication is very difficult. Many products contain dozens of different substances which may have different psychoactive effects as well as other harmful side effects. Inspection of table 5, however, reveals that the leading types of inhalants used are volatile solvents and aerosals. These contain toluene and acetone which may be responsible for the psychoactive properties of the majority of the substances used

(Pryor 1986). From what is currently known, both the acute and the long-term harmful effects of these two chemicals are less serious than those of other chemicals that can be inhaled (Pryor 1986; Ron 1986). This is not to say that use of products containing toluene and acetone is a safe practice. As mentioned previously, most commercial products contain many other dangerous ingredients (e.g., lead and other metals in spray paints), and the research on the deleterious effects of toluene and acetone has not had a long enough history to declare them safe.

SUMMARY AND CONCLUSIONS

There is some basis for the perception that Indian youth are more susceptible to inhalant use than their non-Indian peers. Many Indian youth live in disadvantaged and often stressful environments that set the stage for turning to drugs for relief or to seek excitement. Inhalants are cheap and available even to very young children.

While levels of inhalant use are comparatively high, the tendency to overrate this use and to label all Indian youth as inhalant abusers must be avoided. By the time Indian youth reach their senior year, only around 4 percent are using inhalants seriously enough to warrant concern. On the other hand, those 4 percent cannot be ignored and, for them, prevention efforts at earlier ages could avert a great deal of needless suffering. Furthermore, there are a significant number of school dropouts who are likely to be chronically inhalant involved.

The age pattern of inhalant use indicates that such use by Indian youth begins when they are very young--the predisposing factors are well in place by the 4th and 5th grades. Prevention efforts may need to start very early if they are to succeed.

REFERENCES

Annis, H., and Watson, C. Drug use and school dropouts: A longitudinal study. Canadian Counselor 9:155-162, 1975.

Beauvais, F. Social and Psychological Characteristics of Inhalant Abusers. Paper presented at WHO Advisory Group Meeting on the Adverse Health Consequences of Volatile Solvents/Inhalants, Mexico City, April 1986.

Beauvais, F., and Oetting, E.R. Drug use in an alternative high school. J Drug Educ 16(1):43-50, 1986.

Beauvais, F.; Oetting, E.R.; and Edwards, R.W. Trends in drug use of Indian adolescents living on reservations: 1975-1983. Am J Drug Alcohol Abuse 11(3 & 4):209-230, 1985a

Beauvais, F.; Oetting, E.R.; and Edwards, R.W. Trends in the use of inhalants among American Indian adolescents. White Cloud J 3(4):3-11, 1985b.

Fishburne, P.M.; Abelson, H.I.; and Cisin, I. National Survey on Drug Abuse: Main Findings: 1979. Rockville, MD: National Institute on Drug Abuse, 1980.

Goldstein, G.; Oetting, E.R.; Edwards, R.; and Garcia-Mason, V. Drug use among Native American young adults. Int J Addict 14(6):855-860, 1979.

Johnston, L.D.; O'Malley, P.M.; and Bachman, J.G. Use of Licit and Illicit Drugs by America's High School Students, 1975-1984. Rockville, MD: National Institute on Drug Abuse, 1985.

Kaufman, A. Gasoline sniffing among children in a Pueblo Indian village. Pediatrics 51(6):1060-1064, 1973.

Oetting, E.R., and Beauvais, F. The drug acquisition curve: A method for the analysis and prediction of drug epidemiology. Int J Addict 18(8):1115-1129, 1983.

Oetting, E.R., and Beauvais, F. Epidemiology and Correlates of Alcohol Use among Indian Adolescents living on Reservations. Paper presented at NIAAA conference, "The Epidemiology of Alcohol Use and Abuse among U.S. Ethnic Minority Groups," Bethesda, MD, October 1985.

Oetting, E.R., and Goldstein, G.S. Drug use among Native American adolescents. In: Beschner, G., and Friedman, A., eds. Youth Drug Abuse. Lexington, MA: Lexington Books, 1979.

Oetting, E.R.; Edwards, R.; Goldstein, G.; and Garcia-Mason, V. Drug use among adolescents of five southwestern Native American tribes. Int J Addict 15(3):449-455, 1980.

Oetting, E.R.; Beauvais, F.; Edwards, R.; Velarde, J.; and Goldstein, G. Drug Use among Native American Youth: Summary of Findings 1975-1981). Fort Collins, CO: Colorado State University, Western Behavioral Studies, 1982.

Oetting, E.R.; Beauvais, F.; Edwards, R.; and Waters, M. The Drug and Alcohol Assessment System: Book II, Instrument Development, Reliability and Validity. Fort Collins, CO: Rocky Mountain Behavioral Science Institute, Inc., 1984.

Pryor, G.T. Pharmacologic and Neurobehavioral Aspects of Solvent Toxicity based on Animal Studies. Paper presented at WHO Advisory Group Meeting on the Adverse Health Consequences of Volatile Solvents/Inhalants, Mexico City, April 1986.

Ron, M.A. The Long-term Sequelae of Solvent Abuse: Neurological, Psychometric and Psychiatric Aspects. Paper presented at WHO Advisory Group Meeting on the Adverse Health Consequences of Volatile Solvents/Inhalants, Mexico City, April 1986.

Schottstaedt, M., and Bjork, T. Inhalant abuse in an Indian boarding school. Am J Psychiatry 134(11):1290-1293, 1977.

ACKNOWLEDGMENT

This research was supported by grant DA-03371 from the National Institute on Drug Abuse

AUTHORS

Fred Beauvais, Ph.D.
E.R. Oetting, Ph.D.
Department of Psychology
Colorado State University
Fort Collins, Colorado 80523

Inhalant Abuse in a Small Rural South Texas Community: A Social Epidemiological Overview

Alberto G. Mata, Jr., Ph.D., and Sylvia Rodriguez Andrew, M.S.W.

INTRODUCTION

In many of our larger communities since the 1950s, calls for action concerning the voluntary use of volatile substances have served to episodically capture the attention of social scientists, policymakers, and practitioners. Compared to the research on other illicit substances, the study of the etiological and epidemiological factors concerning the usage of volatile substances by youth has suffered from a lack of ongoing systematic and comprehensive research. Yet, as the next youth cohort discovers inhalants, or a new solvent is added to the list, or usage spreads to new segments of the population, once again there are calls for measures to control if not eradicate the voluntary use of volatile substances by youth.

This paper summarizes research data describing the use of inhalants by youth in Frio County--a small, rural South Texas community. The data reported are derived from a sample of 614 6th to 12th grade students who participated in a voluntary survey in the early spring of 1983. A profile of inhalant use in Frio County may suggest several factors for planners and policymakers to consider in addressing inhalant use by youth in Texas communities.

This paper has several goals. First, inhalant use in a small rural South Texas community is profiled. Second, baseline data for drug usage in such a community are provided for policymakers, practitioners, and academics in order to stimulate and encourage further research. Third, a collaborative research strategy and

methodology is described which could be adopted and adapted by other small rural communities concerned with youths' usage of illicit substances and alcohol. The paper provides data concerning onset of drug usage, if any; last time used, how respondents obtain drugs; perception of availability and approval; reasons for use; peer group approval and use of drugs; and, finally, their nonuse.

In the 1950s a growing awareness and concern with youths' use of inhalants emerged. It was not until the 1960s that social scientists began to focus their attention on youths' use of inhalants (Preble and Laury 1967). Originally, concern focused on youths' use of gasoline, paint, and airplane cement ("glue"). Today, awareness and attention have been drawn to nine major distinct volatile substances: aromatic hydrocarbons, aliphatic hydrocarbons, halogenated hydrocarbons, freons, ketones, esters, alcohols, glycols, and gasoline products (Nicholi 1983; Sharp and Brehm 1977).

Some researchers have characterized this inhalant use as one of the more imminent threats and a growing menace in many communities (Tolan and Lingle 1964; Daubert and MacAdam 1980; Taylor and Harris 1970), whereas others have minimized the use as a passing phase in adolescent coming of age in modern industrial society. Many, nonetheless, have considered it to be a serious problem affecting a relatively small number of youth (Jackson et al. 1967; Shanholz 1968). As the next cohort discovers inhalants, or as a new solvent or mode of use is discovered, or as usage "spreads" to elements of the populations not normally associated with inhalants, one witnesses new calls for action. Thus, from the earliest concerns to the present, exact measures of inhalant use have been difficult to establish. Much of what is known has been developed from clinically drawn populations or community-based samples. However, it has been asserted that Mexican-Americans are overrepresented among inhalant users (abusers). The extent, incidence, and prevalence have not been clearly established.

THE PROBLEM IN PERSPECTIVE

Early reports established inhalant use as a practice more commonly associated with early to mid-adolescent youth who were generally males and in which low-income ethnic minority youth were generally overrepresented (Glasser and Massengale 1962; Szapocnik et al. 1970; Corliss 1965; Preble and Laury 1967). Inhalant users

were more likely to come from "socially troubled if not disorganized families and communities" (Barker and Adams 1962; Press and Done 1967b; Brozowsky and Winkler 1965; Chapel and Taylor 1968). Inhalant users were characterized as having low self-esteem and low/minimal social skills and as being marginal if not troubled youth (Lawton and Malmquist 1961; Massengale et al. 1963; Sokol and Robinson 1963; Jacobziner 1963; Corliss 1965). Yet many of these findings have been challenged by later studies (Press and Done 1967a, 1967b; Crites and Schuckit 1979; Brecher 1972). Later studies would build upon and expand early 1960s studies. These studies have established that inhalant use as a practice cuts across socioeconomic levels and is not restricted to males; that, while it involves youth in early to mid-adolescence, there is some evidence indicating increasing involvement of young adults; and, finally, given its early onset, potential liability, and ready availability, that inhalant use can be held to be a distinct drug use pattern (Sharp and Brehm 1977).

INHALANTS AND THE BARRIO

The earliest accounts and reports about inhalants drew attention to Mexican-American youth involvement with glue, paint, and gasoline (Sokol and Robinson 1963; Brecher 1972; Ackerly and Gibson 1964). While a longstanding concern, inhalant use has not been as closely studied as have other barrio drug use patterns such as their use of "pot," pills, and other "soft drugs" (Blumer et al. 1967; Bullock 1972; Mata 1978; Guinn 1979; Padilla et al. 1978) or heroin (Chien et al. 1964; Redlinger 1970; Bullington 1978; Moore et al. 1978; Moore and Mata 1982). To date, only a handful of studies have examined barrio youth's use of inhalants (Ackerly and Gibson 1964; Montiel 1978; Padilla et al. 1978; Mason 1979; Andrews and Reyes 1984).

These studies continue to provide support that inhalant use rates are elevated. Sex differences exist in both lifetime and current use of inhalants among barrio youth; however, the gap may be closing (Padilla et al. 1978; Mason 1979; Korman 1980). Onset continues to be associated with early to mid- adolescent years; most users in this age group were found to be experimental rather than chronic users.

Inhalant users were more likely to be using other illicit substances; current use patterns extended into early adult years; and finally, inhalant use was found to be spurred by the relative ease in

obtaining inhalants (i.e., ready availability, low cost, and legality of obtaining many of these substances).

Yet these studies remain focused on urban Mexican-American youth. While some studies of rural Mexican-American drug use have been developed (Globetti 1978; Heiligmann 1973; Forslund 1977; Rootman 1972), none have focused on rural youth's use of inhalants. Rural communities' concerns about their youths' use of alcohol and drugs are no less than those of their urban counterparts (Guinn 1978; Jones and Massey 1980). However, there is little information on the extent or pattern of use of inhalants among rural youth.

In addition to the incidence and prevalence of inhalant usage, attention has been drawn to two factors alleged to promote if not encourage youths' use of inhalants. First, the initial and continuing involvement of adolescents with inhalants is in part attributed to the relative ease of obtaining these substances. Second, in addition to being easily obtainable, it is argued that the use of inhalants is more accepted or approved among the adolescent peer group than is the use of other substances. While these two factors are held to be important in youths' decision to experiment and in their continued use, they have generally only been given passing attention in research. It is assumed that inhalants are more readily available and more acceptable than other drugs, but there are few studies exploring whether in fact this is true. In earlier studies of Mexican-Americans' use of inhalants, their involvement with inhalants was attributed partly to these two factors, yet many of these studies relied on anecdotal evidence or limited data to support their claims.

Thus, from the earliest calls for action to the present, urban Mexican-American youths' involvement with inhalants has been observed. But the exact nature, dynamics, and consequences of barrio youths' use of inhalants have been difficult to determine. One will find that a handful of studies exist, yet attention and efforts are uneven, episodic, and limited. Even less developed are studies of rural Mexican-American youths' use of inhalants and other illicit substances. The following report aims to provide some data and understanding of inhalant use among rural South Texas youth.

In this paper, three different aspects of inhalant use are examined. First, a profile of inhalant use among Frio county youths is

presented. Specifically, the study profiles inhalant users in terms of lifetime use, onset of use, patterns of use, peer group usage, and availability of illicit substances. Second, inhalant users are compared to noninhalant users in terms of use of other illicit substances. Third, inhalant use is examined for ethnic differences between Anglo and Mexican-American users.

BACKGROUND AND CONTEXT OF FRIO COUNTY YOUTH ALCOHOL AND DRUG USE STUDY

The research project was conceived and conducted as a voluntary action research project. It was premised and dependent upon a collaborative research methodological strategy and process (Moore 1978; Moore and Mata 1982). It is an approach where the subjects of the research are involved through the investigation process. Originally, it involved the Frio County Alcoholism Prevention Project and Frio County Alcoholism and Alcohol Study Project Task Force director and program coordinator. Later it would involve a committee--Frio County Youth Drug and Alcohol Study Project Task Force (FCYDAP)-- composed of parents, grass roots community leaders, and school officials.

The chief aim of the Frio County Youth Alcohol and Drug Use Study (FCYAP) is to provide baseline data concerning psychosocial and sociocultural factors related to drug and alcohol use among Frio County 6th through 12th grade youth.[1]

Given the project's aims and goals, the Research Study Director developed a self-report questionnaire. The instrument and the rationale underlying the overall instrument and each item were presented to the Study Task Force for their review and recommendations. In addition to the instrument, the procedure for distributing and collecting the data and for analyzing and presenting the data was also reviewed and discussed with Task Force members.

Data for this project and this report were collected in the early spring of 1983, in cooperation with the Frio County Alcoholism Prevention Project, and the Dilley and Pearsall Independent School Districts. Data collection was accomplished through the use of a self-administered questionnaire. In the fall of 1983, preliminary results concerning youths' values, behavioral preferences, and helpseeking behaviors were presented to Task Force members.[2]

The Community Context

According to the 1980 census, Frio County's population was 13,785.[3] The major cities were Pearsall (7,383) and Dilley (2,575). Pearsall is the county seat. Frio County is largely agricultural and rural, sharing many of the same social, economic, and political problems that face other South Texas communities.

Eighty-six percent of the county population is Mexican-American, 13 percent is Anglo, and less than 1 percent is black. In 1979, 69 percent of the population had an annual income of less than $5,000. A 1981 Bureau of Labor Statistics (BLS) study found that 71 percent of the county population's income ranged from low to moderate levels.

The Schools

The county's two major independent school districts are the Pearsall Independent School District and the Dilley Independent School District. The Pearsall school district consists of six schools. The senior high school enrollment is 703; the junior high school enrollment is 603. Dilley school district has 183 senior high school students and 287 junior high school students.[4]

METHODOLOGY

Procedures

All 6th through 12th grade students were asked to voluntarily participate in the study. To qualify, each student and his or her parent(s) had to sign an informed consent letter. Survey participants were released from the classroom and were administered the questionnaire in a 2 1/2 hour session. Dissemination, instructions, and collaboration were under the auspices of the University of Texas Austin School of Social Work research team. In order to secure participation and trust, students were again told that their participation was voluntary and that, if they chose, they could omit the answer to any item.

All efforts were taken to insure confidentiality and anonymity of responses. Consent forms and questionnaires were separated; questionnaires could only be identified by research staff using a coded identification list. Participants were assured that data would only be handled by the research staff and that they would

be reported in aggregate so that no particular individual could be identified.

The Sample

The original sample consisted of 653 students; of these, 39 were of ethnic groups other than Mexican-American or Anglo. Because of the small number, they were excluded from the analysis. The analysis included 614 students. This sample represents slightly less than one-third of all eligible students. Comparison of school census and the sample indicates an undercount of 6th grade students. Coverage of all other grades ranges from 55 percent to 48 percent. Fifty-two percent are females, 48 percent are males.

The Instrument

This self-report study utilized a 236-item questionnaire. Lifetime use was derived from student's report of inhalant use--[1] "never used" or [2] "ever used." Patterns of usage were derived from a measure where respondents indicated when they last used inhalants: [0] never; [1] 1-30 days, to be referred to as "current use"; [2] 2-6 months, to be referred to as "occasional use"; and [3] 7 months ago or more, to be referred to as "experimental use." Nine major substances were focused upon: cigarettes, alcohol, marijuana, cocaine, amphetamines, inhalants, LSD, tranquilizers, and sedatives.

Utilizing dichotomous measures, students were asked if each substance was [0] "easy" or [1] "hard" to obtain and if their friends [0] "had" or [1] "had not" used them.

Respondents were also asked to indicate if their friends [1] "approved" or [2] "did not approve" the use of cigarettes, marijuana, amphetamines, tranquilizers, alcohol, inhalants, or LSD. To measure the degree of difficulty in obtaining inhalants, amphetamines, alcohol, tranquilizers, marijuana, and opium, a five-point Likert scale was used which ranged from [0] "impossible" to [4] "very easy." TAU-B was utilized to measure the association between respondent's ever use of inhalants and other substances. Chi square was used to examine the association of inhalant use with measures concerning ease or difficulty in obtaining said drugs, whether or not their friends use, and ethnic group differences.

RESULTS

Lifetime Use Measures

Slightly over 11 percent of all students reported ever having used inhalants. While Mexican-Americans (11 percent) were little more likely than Anglos (9 percent) to have ever used inhalants, the more significant differences existed between males (14 percent) and females (8 percent) on lifetime use. When controlling for ethnicity, Mexican-American males were found more likely to have ever used than Mexican-American females (X^2, 1 df = 4.27, $p < .05$). Yet for Anglos, the gender differences were not found to be significant (see table 1). Differences between Mexican-American and Anglo rates of inhalant use were not found to be significant.

In terms of school level, 59 percent of the users were senior high school students. When examining inhalant use by grade, one finds that onset of the use of inhalants is most likely to occur in mid to early adolescence.

Unlike patterns of other substance use where lifetime use levels are more likely to increase in mid to late adolescence, the number of inhalant users decreased markedly (except among 11th graders).

In terms of lifetime use of inhalants, cigarettes, alcohol, and other substances, inhalant users were more likely to use all other substances except alcohol, cocaine, and LSD than were nonusers. Inhalant users were significantly more likely to have ever used tobacco (TAU-B = .12807, $p < .01$), marijuana (TAU-B = .17131, $p < .01$), and amphetamines (TAU-B = .12568, $p < .01$). Inhalant users were also more likely to use sedatives and tranquilizers, but the differences were not significant.

Lifetime use of other substances comparing inhalant users and nonusers was examined controlling for ethnicity. For Mexican-Americans, inhalant users were significantly more likely than nonusers to have ever used all drugs except alcohol, cocaine and LSD. For Anglos, lifetime use of other drugs by inhalant users was only found to be significant for tobacco and marijuana. No marked differences were found between Mexican-American and Anglo inhalant users in their use of other illicit drugs.

Onset

When comparing age of onset for inhalants and for other drugs, inhalants are one of the first drugs used. Of those using inhalants, four out of five reported that their initial experience occurred on or before their 14th birthday. Not only is inhalant use an initiating drug experience, it is one where onset is closely associated with early to mid-adolescence rather than with late adolescence or young adult years.

While onset is largely an early to mid-adolescent experience, at each grade level there are some inhalant users. When comparing onset of inhalant use to onset of other illicit substance use regardless of age level, onset levels for inhalants are lower than onset levels for tobacco, alcohol, marijuana, or amphetamines.

In terms of onset of inhalant use as compared to onset of other drug use, except for the age levels of 13 to 14 and 15 to 16 years of age, Mexican-American males' onset of inhalant use is closely associated with the onset of marijuana and amphetamine use. For both Anglo and Mexican-American females, mid-adolescent years are peak periods for experimentation with all drugs.

While Anglo males are more likely to utilize tobacco and alcohol earlier than their female counterparts, their use of marijuana, amphetamines, and inhalants occurs a little later than it does for Mexican-American males. For youth who begin to use drugs in early adolescence, inhalants are central to their initial experimentation.

Concerning ethnicity and onset, Mexican-Americans males have higher rates of initial use among 10- to 14-year-olds than do Anglo males. For both Anglos and Mexican-Americans, initial use markedly declines after mid-adolescence.

In terms of gender and onset, experiences for males peak in early adolescent years. For females, onset experiences are more likely to be associated with mid-adolescent years, although Anglo females begin slightly earlier than Mexican-American females. Initial use experience markedly declines from late mid-adolescence to early adult years for females also.

In the early adolescent years, Mexican-American males' onset rate is substantially higher for all other groups. In early

220-583 0 - 88 - 3 : QL 3

TABLE 1

Percent Total Sample Reporting Ever Using Selected Substances By Sex and Ethnicity

	Males	
	Mexican American (N=255)	Anglo (N=43)
Cigarettes	51	58
Alcohol	61	63
Marijuana	41	30
Cocaine	9	2
Amphetamines	19	12
LSD	12	7
Inhalants	14	12
Tranquilizers	12	9
Sedatives	11	5

	Females	
	Mexican American (N=237)	Anglo (N=79)
Cigarettes	34	46
Alcohol	51	65
Marijuana	23	29
Cocaine	4	5
Amphetamines	11	22
LSD	6	11
Inhalants	8	8
Tranquilizers	3	11
Sedatives	4	11

Mexican Americans

Males (N=255) | Females (N=237)

Anglos

Males (N=43) | Females (N=79)

mid-adolescence (ages 13 to 14), Mexican-American females' onset equals that of Mexican-American males. At age 15 to 16, for both Anglo and Mexican-Americans females, onset exceeds that of their male counterparts. From mid to late adolescence and on through the early adult years, initial use markedly declines for all groups.

In summary, when comparing onset rates for inhalants with those for other drugs, inhalant onset occurs at a relatively young age. This is true even though fewer respondents have used inhalants than have used other drugs.

Patterns of Use

Eleven percent of the sample that they reported have ever used inhalants: 5 percent reported to have used them in the last 30 days, 2 percent have used them 2 to 6 months ago, and 4 percent have used them 7 months ago or more.

In terms of gender, males' current use (7 percent) is nearly twice that of females' (4 percent). Males' occasional use (2 percent) is twice that of females' use (1 percent), and males' experimental use (5 percent) is nearly twice that of females' (3 percent). In terms of ethnicity, one finds few differences between Mexican-American and Anglo patterns of usage.

Mexican-American male use patterns are consistently higher than those of their ethnic and gender counterparts; at the same time, Mexican-American females report some of the lowest rates, yet the differences were small.

When examining gender and ethnic specific group differences, one finds that current use by Mexican-American males (7 percent) is only slightly higher than Anglo females (5 percent) or Anglo males (5 percent), with Mexican-Americans females reporting the lowest current use level (4 percent). In terms of occasional use, Mexican-Americans males (3 percent) and Anglo females (3 percent) exceed Anglo males and Mexican-American females (1 percent).

Availability and Acceptability of Inhalants

In terms of various substances being available (easy or hard to obtain), the total sample reported that alcohol, tobacco, inhalants,

and marijuana are easier to obtain than are cocaine, LSD, amphetamines, tranquilizers, and sedatives. When comparing inhalant users' perceptions of the relative ease or difficulty in obtaining various substances, students report that inhalants (65 percent) are more easily obtained than are cigarettes (64 percent), alcohol (56 percent), or pot (42 percent). In fact, about 7 out of 10 inhalant users are likely to report cigarettes and inhalants are easily obtained,and 6 out of 10 inhalant users report alcohol and marijuana as being easily obtained.

Although noninhalant users are more likely to report some degree of difficulty in obtaining alcohol, marijuana, and inhalants than do inhalant users, the differences are small. Noninhalant-using youths report inhalants to be the third most easily obtainable substance, while users indicate that it is the most easily obtained substance. Inhalant users are more likely to indicate that pot and amphetamines are easier to obtain, while nonusers are more likely than inhalant users to indicate that tranquilizers and sedatives are more easily obtained.

In table 2, the perceived ease of obtaining inhalants and other substances is shown by sex and ethnicity. Anglos are significantly more likely to perceive cigarettes, marijuana, amphetamines and sedatives as easy to obtain than Mexican Americans regardless of sex.

FRIENDS' USE OF ALCOHOL AND ILLICIT SUBSTANCES

The level of difficulty of obtaining various substances reported by inhalant users and nonusers is shown in table 3. Table 4 shows the rate of friends' use of various substances. When inquiring if their friends use various substances, one finds that friends' use varies by substance and that inhalants are one of the lower levels of use. Except for alcohol, cocaine, and amphetamines, inhalant users were more likely than nonusers to report that their friends use all other substances. While Mexican-Americans were slightly more likely than Anglos to indicate that their friends used various substances, the differences were small except for amphetamine use.

FRIENDS' APPROVAL

Another measure of acceptability involves whether the respondent's friends approved of the use of various substances.

TABLE 2

Percent of Total Sample Reporting Ease in Obtaining Selected Substances For Mexican-American and Anglo Students By Sex

	Males	
	Mexican-American (N=255)	Anglo (N=43)
Cigarettes***	71	88
Alcohol	63	67
Marijuana*	57	61
Cocaine	48	40
Amphetamines**	56	65
LSD	54	42
Inhalants	64	77
Tranquilizers	49	63
Sedatives**	50	63

	Females	
	Mexican American (N=237)	Anglo (N=79)
Cigarettes***	67	85
Alcohol	62	76
Marijuana*	57	73
Cocaine	47	54
Amphetamines**	61	73
LSD	48	57
Inhalants	59	79
Tranquilizers	52	57
Sedatives**	46	63

*differences among sex-ethnic groups significant at the .05 level
**$p \leq .01$
***$p \leq .001$

TABLE 3

Percent of Inhalant Users and Non Users Reporting Level of Difficulty in Obtaining Selected Substances

	Impossible	Very Difficult	Fairly Difficult	Fairly Easy	Very Easy
Inhalant Users (N=66)					
Alcohol	15	19	14	22	41
Marijuana	28	11	15	23	33
Inhalants	39	14	20	14	13
Amphetamines	42	17	12	30	19
Tranquilizers	43	14	25	14	14
Opium	49	16	19	14	12
Non Users of Inhalants (N=548)					
Alcohol	19	18	13	22	38
Marijuana	27	15	13	22	23
Inhalants	37	18	15	18	12
Amphetamines	39	20	17	17	17
Tranquilizers	39	22	21	14	15
Opium	49	26	14	19	12

The percent of inhalant users and nonusers who report their friends' approval of various drug use is shown in table 5. For all substances except cigarettes and alcohol, inhalant users were more likely to indicate that their friends approved the use of various drugs. When comparing friends' approval by user status and controlling for ethnicity, one finds that Mexican-American nonusers were less likely to approve of inhalants, amphetamines, LSD, pot, and cigarettes than were Mexican-American users.

Among Anglos, the only significant difference between users and nonusers concerned inhalants. Again, nonusers were less likely to approve the use of inhalants. Among inhalant users, Anglo respondents' friends were more likely to approve the use of pot and alcohol than were Mexican-Americans', while Mexican-Americans were more likely to report that their friends approved the use of cigarettes, amphetamines, tranquilizers, inhalants, and LSD. Yet, only as it concerns cigarettes were those differences found to be statistically significant.

Regardless of the ethnicity and inhalant user status, one finds that friends' use of inhalants is lower than the use of tobacco, alcohol, and marijuana and that, in terms of acceptability, inhalants have very low approval.

CONCLUSIONS

Eleven percent of this sample of Frio County youths report some lifetime use of an inhalant. As compared to lifetime use of tobacco and alcohol and to current patterns of use of other illicit substances, inhalant use is a little higher than it is for LSD, tranquilizers, and sedatives; yet, its use is slightly lower than for amphetamines and substantially lower than for marijuana or alcohol and/or tobacco. While substantially lower than the rate of inhalant use reported by Padilla et al. (1978), this rate is substantially higher than that reported in the 1980 State of Texas Household Survey. The level reported herein more closely corresponds to those reported in a 1982 national household survey.

The rate for males is twice the rate for females; yet Mexican-American lifetime use is only slightly higher than Anglo use. From the earliest studies, males and Mexican-Americans have been found to be overrepresented among inhalant users. Yet later

TABLE 4

Percent of Mexican American and Anglo Students By Sex Reporting Friends Used Selected Substances

	Males	
	Mexican American (N=255)	Anglo (N=43)
Cigarettes	67	70
Alcohol	65	63
Marijuana	57	61
Cocaine	36	26
Amphetamines	49	35
LSD	42	26
Inhalants	37	35
Tranquilizers	36	28
Sedatives	61	74

	Females	
	Mexican American (N=237)	Anglo (N=79)
Cigarettes	49	55
Alcohol	54	68
Marijuana	57	73
Cocaine	33	28
Amphetamines	37	39
LSD	30	28
Inhalants	29	28
Tranquilizers	26	24
Sedatives	76	71

TABLE 5

Percent of Inhalant Users and Nonusers Reporting Friends' Approved Use of Selected Substances

	Inhalant Users (N=66)	Nonusers (N=548)
Cigarettes	73	66
Marijuana	50	44
Amphetamines	47	40
Tranquilizers	32	35
Alcohol	58	60
Inhalants*	46	33
LSD	36	35

*difference between users and nonusers friends' approval is significant at .004 level.

studies have suggested that these differences reflect institutionally and clinically biased samples rather than true incidence, prevalence, or lifetime rates. Just as the substances used have changed, it may be that these findings will provide some sense of change in users' characteristics. It will remain an important question that future research should continue to address and examine.

Similar to other studies (Sharp and Brehm 1977; Wyse 1973; Cohen 1978), the first use of inhalants was found to occur in early to mid-adolescence. It will be important to examine further what factors contribute to youths continuing early involvement with inhalants. While ethnic differences were minimal, it will be important to see if the gender gap remains the same or closes.

Age, gender, and ethnic differences exist to a lesser degree when analyzing inhalant usage patterns. Current use by Mexican-Americans and by males exceeds use by Anglos and by females. These variables exhibit a contrasting interactive effect; while current use by Mexican-American males is the highest of the four groups, current use by Mexican-American females is the lowest. Mexican-American cultural, familial, and peer values, behavioral preferences and roles shaping Mexican-American youths' sex-role expectations may account for differences in Mexican-American male and females patterns. Closer study of this phenomenon is needed to identify and understand the factors and dynamics underlying this contrast.

Of those reporting to have ever used, 50 percent of the students used 2 to 6 months ago and 33 percent used 7 months or more ago (experimental users). Mexican-American and male usage patterns are generally higher than those of Anglos or females. The sharper contrasts exist between male and female use patterns which indicate that male lifetime use is two to three times that of females. Additional attention should be focused on factors promoting low rates of inhalant use.

Factors alleged to initiate, if not serving to promote, youth involvement with inhalants are its accessibility and availability. Various studies have suggested that inhalant usage is promoted by its low cost and by the ease in obtaining inhalants as compared to alcohol and other drugs and that it generally enjoys greater acceptance than does youths' experimental use of other substances. Studies have also noted the potentially significant role of friends'

use of inhalants and other drugs not only in terms of their initial use but in terms of continued use. With respect to these questions, few studies have examined inhalants in comparison with alcohol and other drugs or in terms of other activities.

The study's respondents as a whole ranked inhalants as the third most easily obtainable illicit substance (only tobacco and alcohol ranked easier to obtain). Inhalants were perceived to be only slightly easier to obtain than marijuana or amphetamines. Yet respondents' use level and reports of their friends' use indicate that inhalants have one of the lower levels of use. Only respondents' and friends' use of tranquilizers and LSD is less than their use of inhalants.

Also, inhalant users are more likely to say that their friends approve of the use of other drugs than approve of inhalant use. The friends' approval rating of inhalant use is the third lowest of all illicit substances.

The finding suggests that friends' approval is more important than availability of a substance. While inhalants are one of the more easily obtainable substances, they are not used by most respondents. Their friends are also less likely to use inhalants and more likely to use substances like alcohol and marijuana. Not only was friends' use of inhalants low, but also friends of respondents did not approve of using inhalants.

CLOSING OBSERVATIONS

Since the 1950s, local and State calls for action concerning inhalants have episodically captured policymakers, practitioners, and social scientists' attention, interests, and concerns. A serious concern in many major urban Mexican-American barrios has been with youths' use of inhalants. In small rural communities, youths' use of alcohol and illicit drugs has gone largely unnoticed and has been neglected by researchers concerned with drug use in the barrios. Yet, for residents of these communities, it is no less a concern or challenge. In its effort to meet this challenge, social science research will need to continue to focus some attention on these small communities. In terms of this study's findings, particular questions remain salient ones.

The first question begins with the study's findings concerning lifetime use, patterns of use, and onset: Are they similar to

youths' use in other small rural communities? Earlier studies established the overinvolvement of young males and Mexican-Americans, yet other studies' findings suggest that the gap in inhalant use between Mexican-Americans and Anglos and between the sexes is closing. The next question, then, concerns whether this gap is closing, and if so, what are the contributing factors?

Also, it is clear that inhalants remain one of the more easily available substances, yet the study found inhalants have low use and approval levels in comparison to other drugs. It will become increasingly important for future studies to examine if use and approval remain low; it will also be important to explore further what factors and dynamics affect availability and approval of particular substances and not others. Particularly questions concerning the reason for use, as well as the reasons for nonuse (i.e., never using, using and quitting inhalants yet using other drugs).

For planning and programming purposes there is a need to keep inhalant use in perspective in relation to the use of other substances. While these findings suggest that inhalant usage represents a distinct pattern of use, prevention and intervention researchers need to keep in mind that inhalants do not involve as many youths as alcohol and marijuana involve. It is not clear if approaches to working with alcohol- and marijuana-using youth are effective with inhalant-using youth. Yet they also need to keep in mind and expand upon the factors that make inhalants one of the more easily obtainable substances, as well as factors that make for its low use and approval levels as compared to tobacco, alcohol, and marijuana. Various measures now suggested range from controlling access and availability to finding additives to inhalants which might serve to discourage more use. The bulk of these efforts remain focused on educating and informing the youth at risk. Its low use and approval may be a function of the development of norms concerning inhalants rather than norms concerning use of alcohol and other drugs.

Also, while inhalants have low levels of use and approval, they are one of the first substances that youth begin to use. Use of inhalants occurs in early to mid-adolescent years. To more adequately understand this aspect of inhalant use, three key questions need to be explored further. First, what factors influence youths' initial decision to use inhalants? Second, what factors influence their decision(s) to cease using inhalants but

move on to other drugs or to continue using inhalants? Third, what factors, if any, distinguish experimental and chronic usage patterns? While beyond the scope of these data and this report, hopefully, these findings provide insight and basis for more informed social intervention efforts than previously existed.

FOOTNOTES

[1]FCAPP Project and FCYDAP Study Task Force members requested information that would assist them in determining the nature and extent of youths' use, attitudes toward, reasons for use, and, finally, reasons for not using or quitting their use of alcohol and drugs. These data should serve as a needs assessment. In addition to facilitating their planning and programing efforts, they should also provide some baseline measures for future monitoring and related evaluative efforts.

[2]This report represents a more in-depth examination and presentation that was also presented and discussed with the Frio County Alcoholism Prevention Project and FCYAP Task Force members. It is a report aimed at providing FCAPP and FCYAP Task Force members with some insight and data about inhalant-using youth for their planning and programming efforts.

[3]Frio County is located southwest of San Antonio, Texas, and is the southernmost boundary of the Alamo Area Council on Government (AACOG). Created in 1858 and reorganized in 1871, its name was taken from the Frio River which flows through the county.

[4]Both school districts are working cooperatively with the Frio County Youth Alcoholic Project (FCYAP). FCYAP is the first official program to address alcohol-related problems of youth in Frio County. Its concern is with primary prevention. Supported by State funds, the program is implemented by the county. The program is directed by Sidney Williams III, County Judge, and is coordinated by Mrs. Maria Elena Fernandez-Jasso, MSW.

As it concerns this research effort, liaison and coordinating efforts are directed by the program director, FCYAP, and the Study Task Force. Each school district has a faculty member participating on the committee and she/he is the key liaison person to her/his school district and its respective junior and senior high schools.

REFERENCES

Abelson, H.I.; Fishburne, P.M.; and Cisin, I. National Survey on Drug Abuse: 1977. Rockville, MD: National Institute on Drug Abuse, 1978.

Ackerly, W., and Gibson, G. Lighter fluid sniffing. Am J Psychol 9:1056-1561, 1964.

Albaugh, B., and Albaugh, P. Alcoholism and substance sniffing among the Cheyenne and Arapaho Indians of Oklahoma. Int J Addict 14(7):1001-1007, 1979.

Andrews, S. The Use of Inhalants by Mexican-American Children and Adolescence. Unpublished paper. Worden School of Social Services, Our Lady of the Lake University, San Antonio, 1984.

Barker, G., and Adams, W. Glue sniffers. Sociology Res 47:289-310, 1973.

Bass, M. Sudden sniffing death. J Am Med Soc 212(12):2075-2079, 1970.

Blatherwick, C.E. Understanding glue sniffing. Can J Public Health 63:272-276, 1972.

Brecher, Edward M. The historical antecedents of glue sniffing. Licit and Illicit Drugs. Boston: Little, Brown and Company, 1972a. pp. .

Brozowsky, M., and Winkler, E.G. Glue sniffing in children and adolescents. NY State J Med 65:1984-1989, 1965.

Chapel, I., and Taylor, D.W. Glue sniffing. Mi Med 65:288-296, 1968.

Cohen, Sidney. Inhalants and solvents. Youth Drug Abuse: Problem Issues and Treatment. Lexington, MA: Lexington Books, 1979. pp. 285-315.

Corliss, L.M. A review of the evidence on glue sniffing - A persistent problem. J Sch Health 35(10):442-449, 1965.

Crites, J., and Schuckit, M.S. Solvent misuse in adolescents at a community alcohol center. J Clin Psychiatry 40:39-43, 1979.

Daubert, M., and MacAdam, C. Gasoline inhalation: A community challenge. Can Nurse 76(10):24-25, 1980.

Epstein, M.H., and Wieland, W.F. Prevalence survey of inhalant abuse. Int J Addict 13(2):271-284, 1978.

Garriott, J.; and Petty, C.S. Death from inhalant abuse: Toxicological and pathological evaluation of 34 cases. Clin Toxicol 16930:305-315, 1980.

Glasser, H.H., and Massengale, O.A. Glue sniffing in children. JAMA 181(4):300-303, 1962.

Globetti, G. High school students and the use of alcohol in a rural community: A research note. J Drug Issues 8:435, 1978.
Gossett, J.T.; Lewis, J.M.; and Phillips, V.A. Extent and prevalence of illicit drug use as reported by 56,745 students. JAMA 216:1464-1470, 1971.
Grabski, D.A. Toluene sniffing producing cerebellar degeneration. Am J Psychiatry 118(3):461-462, 1963.
Harrel, A., and Lisn, H. Drug Abuse in Rural Areas, Rockville, MD: National Institute on Drug Abuse, 1981.
Heiligman, A. A survey of drug use in a rural Minnesota senior high school. Drug Forum 2(2):173-177, 1973.
Jackson, R.; Thornhill, E.; and Gonzales, R. Glue sniffing - Brief flight from reality. J La State Med Soc 119(11):451-454, 1967.
Jacobinzer, H., and Raybin, H.L. Lead poisoning and glue sniffing intoxications. NY State Sch Med 63:2846, 1963.
Lawton, J.J., and Malmquist, C.P. Gasoline addiction in children. Psychiatr Q 35:555-561, 1961.
Lerner, S.E., and Linder, R.L. Drugs in elementary school. J Drug Educ 4:317-322, 1975.
Lowenstein, L.F. Glue sniffing: Background features and treatment by aversion methods and group therapy. Practitioner 226:1113-1116, 1982.
Malcolm, A.I. Solvent sniffing and its effects. Addictions (Toronto) 15(2):12-21, 1968.
Mason, Terry. Inhalant Use and Treatment. Rockville, MD: National Institute on Drug Abuse, 1979.
Mathews, R.W., and Korman, M. Abuse of inhalants: Motivation and consequences. Psychol Rep: 519-520, 1981.
Merki, C.J. Special problems with drugs and inhalants. In Merki, D.J., Drug Abuse: Teenage Hangup. Dallas: Texas Alcohol Narcotics Education, 1970. pp. 85-91.
Montiel, M., et al. Paint Inhalation Among Chicano Barrio Youth: Inside View. School of Social Work, Arizona State University, 1976.
Montiel, M. Paint Inhalation Among Chicano Barrio Youth: An Exploratory Study. School of Social Work, Arizona State University, 1982.
Moore, J.W.; and Mata, A.G., Jr. ELA Women and Heroin Report. Los Angeles: Chicano Pirto Research Project, 1982.
National Institute on Drug Abuse. Services Research Report. An Investigation of Selected Rural Drug Abuse Programs. Publication No. (ADM) 77-457, Rockville, MD: 1977.

National Institute on Drug Abuse. Services Research Report. Non-Urban Drug Abuse Programs: A Descriptive Study. Publication No. (ADM) 78-636, Rockville, MD: 1978.

Nobrenkis, Alexis; Macari, Mary; and Letterri, Dan. Drug Abuse Instrument Handbook. Research Issues No. 12, Rockville, MD: National Institute on Drug Abuse, 1976.

Nicholi, A.N., Jr. The inhalants: An overview. Psychosomatics 24(10):914-921, 1983.

Padilla, E.R.; Padilla, A.M.; Morales, A.; Olmedo, E.; and Ramirez, R. Inhalant, marijuana and alcohol abuse among barrio children and adolescents. Int J Addict 14(7):945-964, 1979.

Pohlit, A. Determination of fluorocarbon 11 and fluorocarbon 12 in post-mortem tissues: A case report. Forensic Sci 3:53-59, 1975.

Preble, E.; and Laury, C.V. Plastic cement: The ten cent hallucinogen. Int J Addict 2(2):271-281, 1967.

Press, E.; and Done, A.K. Solvent sniffing: Physiologic effects and community control measures for intoxication from the intentional inhalation of organic solvents. Pediatrics 39(4):451-461, 1967a.

Press, E.; and Done, A.K. Solvent sniffing: Physiologic effects and community control measures for intoxication from the intentional inhalation of organic solvents. Pediatrics 39(4):611-622, 1967b.

Press, E. and Sterling, J. Glue sniffing: Incidence, physiological effects and police measures for controlling the inhalation of glue and other organic solvents. Police Magazine 12:14-20, March-April 1968.

Rootman, I. Drug use among rural students in Alberta. Canada's Mental Health 20(6):9-14, 1972.

Rosenblatt, A., and Mayer, J.E. Hotlining for family problems. Am J Psychiatry 128:1136-1140, 1972.

Shamhole, M.I. Glue sniffing: A new symptom of an old disease. Va Med Assoc 95:304-305, 1968.

Sharp, C., and Brehm, M. Review of Inhalants: Euphoria to Dysfunction. National Institute on Drug Abuse Research Monograph 15. Rockville, MD: The Institute, 1977.

Sokol, J., and Robinson, J.L. Glue sniffing. West Med 4:192-214, 1963.

Stybel, L.; Allen, C.; and Lewis, F. Deliberate hydrocarbon inhalation among low socio-economic adolescents not necessarily apprehended by the police. Int J Addict 11(2):345-361, 1976.

Szapocnik, J.; Daruna, P.; Scopetta, M.A.; and Aranalde, M. The characteristics of Cuban immigrant inhalant abusers. Am J Drug Alcohol Abuse 4(3):377-389, 1970.

Taylor, G.J., and Harris, W.S. Cardiac toxicity of aerosol propellants. JAMA 214:81-83, 1970.

Tolan, E.J., and Lingl, F.A. "Model psychosis" produced by inhalation of gasoline fumes. Am J Psychiatry 120:757-761, 1964.

Tolone, W., and Dermott, D. Some correlates of drug use among high school youth in a midwestern rural community. Int J Addict 7(4):655-669, 1975.

Wyse, D.G. Deliberate inhalation of volatile hydrocarbons: A review. Can Med Assoc J 108:71-74, 1973.

AUTHORS

Alberto G. Matta, Jr., Ph.D.
Center for Health Promotion
School of Public Health
University of Texas Health Sciences Center
Houston, Texas

Sylvia Rodriguez Andrew, M.S.W.
Center for Social Service Research
Our Lady of the Lake University
San Antonio, Texas

The Continuing Problem of Youthful Solvent Abuse in New York State

Blanche Frank, Ph.D., Rozanne Marel, Ph.D., and James Schmeidler, Ph.D.

INTRODUCTION

In June 1976, the United States and Mexican governments held an international conference on the voluntary inhalation of industrial solvents. At that time, a paper was presented highlighting findings for solvent or inhalant use from a survey of secondary school students in New York State (Stephens et al. 1978). The survey had been conducted by the state's substance abuse agency during the winter of 1974-75. The paper was entitled "Sniffing from Suffolk to Syracuse: A Report of Youthful Solvent Use in New York State." Since then, two similar surveys have been conducted in New York State among secondary school students--in 1978 and in 1983. This paper updates the findings for inhalant use described in the earlier paper using the two subsequent surveys. Despite the hazardous nature of inhalant use, the major finding is that the practice--the sniffing of such substances as glue, gasoline, and paint thinner--in this youthful population has increased significantly.

Earlier Survey Findings: 1974-75

The analysis of findings for solvent abuse from the 1974-75 survey, based on a self-administered questionnaire given to a sample of public school students in grades 7 through 12 throughout New York State, was guided by some generalizations found in the literature about the nature of solvent abusers (Stephens et al. 1978, p. 24). Among the generalizations from the literature are the following:

1. Most solvent users are in their preteen and early teen years.
2. There are many more male than female solvent users.
3. Solvent users tend to perform poorly in school.
4. Solvent users frequently come from broken homes.

The earlier survey found that, indeed, solvent use is an early teen phenomenon, that there is a relationship between poor performance in school and solvent use, and that there is some support for the relationship between broken homes and solvent use. Other findings, however, did not agree with previously published studies. In contrast to the remaining generalization, solvent use among females and males was almost the same.

In addition, the earlier survey made its own unique contribution to the understanding of solvent use. First, solvent use should be viewed in the context of a more general drug-using or polydrug pattern; and, second, youngsters who begin with solvents may be much more likely to become drug-involved on a more serious level than those whose first drug is marijuana.

The analysis of findings for solvent use from the later surveys in 1978 and 1983 is guided by these generalizations in the literature and by the unique findings in the earlier survey.[1] In addition, especially in the last decade, the literature has documented the higher use of solvents among American Indians as well as Hispanics (Beauvais 1985; Weibel-Orlando 1984; Bonnheim and Korman 1985; Dworkin and Stephens 1980). Thus, survey findings for solvent use among ethnic groups are examined. In an effort to increase the understanding of solvent abuse among youth, unique findings culled from the surveys of 1978 and 1983 are also described.

Later Surveys: 1978 and 1983

Very much like the earlier survey of 1974-75, the subsequent surveys sampled students in grades 7 through 12 in school districts throughout New York State. The sample was stratified by similar regions of the State and by degree of urbanization. The self-administered questionnaire used in all three surveys was generally alike in content, and numerous precautions were taken to protect the anonymity of the students participating. Although the surveys were voluntary, most school districts selected did participate, and

the vast majority of students in the selected classes also participated.

In a few respects, however, the surveys differed one from another.

1. The number of questionnaires used in the analysis of the 1974-75 survey (8,553 questionnaires) was considerably smaller than the number in the 1978 questionnaires (35,317) and the 1983 survey (27,414 questionnaires). Although 22,600 questionnaires were submitted in the earliest survey, the coding at that time was considered too formidable and so a random sample of 8,553 questionnaires was drawn from the larger number received.

2. Although the 1974-75 survey included only public schools, the 1978 survey also included a sample of private religious schools, and the 1983 survey also included a sample of private religious schools as well as nondenominational schools. Thus, the successive surveys were able to reflect an increasing proportion of the secondary school population in the State.

3. The specific questionnaire item inquiring into inhalant or solvent use was asked somewhat differently across the surveys. In the 1974-75 survey, the specific drugs were first defined, i.e., "SOLVENTS" (this means sniffing glue, gasoline, or paint thinner); then later on in the same survey the question was asked, "When was the most recent time that you used one of the following?" The category SOLVENTS was one of the eight drugs or drug categories listed without stating the definition once again. In the two subsequent questionnaires, the items were much more similar to one another:

In 1978: "How many times (if any) have you sniffed GLUE or inhaled SOLVENTS or SPRAYS for 'kicks' or a 'high'?"

In 1983: "How many times (if any) have you sniffed GLUE or inhaled a SPRAY or LIQUID (such as paint thinner, gasoline, etc.) for 'kicks' or a 'high'?"

In two later surveys, it was clear that the intent of inhalant use was for "kicks" or a "high." In the first and third surveys, the substances offered as examples were the same.

4. A procedural change took place in 1983 in the New York City public school sample. Unlike the previous surveys, the New York City Board of Education required formal parental or guardian approval before a student could participate in the survey. This requirement may have produced an underestimation of substance use rates for New York City in 1983 as well as for the State.

Bearing these differences in mind, the following sections will present the survey findings for solvent use among New York State's secondary school students over a period of almost 10 years.

FINDINGS

Overall Trend in Solvent Use

Unlike the findings for the earliest survey, the more recent surveys have found that solvent use is relatively widespread among secondary school students. Whereas in 1974-75, 5.2 percent of the students reported having "ever" used these substances; in 1978, 16.0 percent reported ever use; and in 1983, 21.9 percent reported ever use (table 1). In fact, over this time period, experience with solvent use more than quadrupled in the population of youthful students. This dramatic increase is also reflected in the use rates for the 6 months prior to the surveys, from 1.9 percent in the 1974-75 to 8.3 percent in 1978 and 10.6 percent in 1983.

Table 1 shows solvent use rates across the years by the areas of the State and by grade level. Interestingly, what in 1974-1975 had seemed to be a phenomenon that was more popular in upstate New York than in the other areas, by 1983 had spread out fairly uniformly throughout the State. In 1974-75, upstate students showed a lifetime use rate of 6.4 percent, compared to 5.8 percent for suburban New York students and 3.1 percent for New York City students. Although by 1983 each of the areas of the State

showed considerable increases, the rates were very similar to each other for the three areas of the State--between 21.3 percent and 22.9 percent for ever use and between 10.1 percent and 10.9 percent for recent use. In fact, in 1983 the rate of solvent use was somewhat lower for the upstate New York students than for the New York City and suburban New York students.

The increase in solvent use over time is more notable between 1974-75 and 1978 than between 1978 and 1983. The fact that the questionnaire items asking about solvent use were less comparable between the first and second surveys than the second and third may have accounted for some of the earlier difference in trend. The continued increase in use rates between 1978 and 1983 for very comparable surveys, however, probably indicates a real increase over the whole time period.

The trend in rates for New York City students is of special interest. In the 1974-75 survey, the lower New York City rates for solvent use were partially attributed to the lower percentage of usable responses for the city's students. In the 1978 survey, New York City rates were higher than the city's rates in the earlier survey, but were again found to be appreciably lower than the other areas in the State--10.9 percent ever use compared to 17.0 percent for suburban New York and 17.9 percent for upstate. In 1978, the problem of usable responses was not an issue. By 1983, despite the procedural change requiring parental consent, New York City students showed a marked increase in inhalant use and seemed to catch up with students in the rest of the State--21.7 percent ever use compared to 22.9 percent for suburban students and 21.3 percent for upstate students.

Solvent Use and Grade Level

When comparing rates of solvent use by grade level, the general pattern maintained across the years is that students in the 7th and 8th grades are more likely to have used inhalants recently than are those in the upper grades (9 through 12) and that 9th and 10th graders are generally closer in rates of use to 7th and 8th graders than to 11th and 12th graders. Of interest is the finding that, in the later surveys especially, 9th graders and higher show progressively lower rates of lifetime use with increasing grade level. Since there is no evidence to indicate that lifetime experience with inhalants is greater among 7th and 8th graders, it

TABLE 1

Comparison of Solvent[a] Use Rates Among Secondary School Students in New York State by Area and Grade 1974-75[b], 1978[c], and 1983[d]

Area and Grade Level	1974-75		1978		1983	
	% who ever used	% who used in prior 6 months	% who ever used	% who used in prior 6 months	% who ever used	% who used in prior 6 months
New York State	5.2	1.9	16.0	8.3	21.9	10.6
New York City	3.1	1.4	10.9	5.2	21.7	10.8
7th-8th grade	2.9	1.5	12.0	7.2	22.8	13.3
9th-10th grade	4.0	1.8	11.7	5.3	24.8	12.0
11th-12th grade	1.8	0.7	8.2	2.7	15.6	5.9
Suburbs of New York City[e]	5.8	1.8	17.0	8.8	22.9	10.9
7th-8th grade	5.4	3.0	20.6	14.0	27.2	15.6
9th-10th grade	6.0	1.8	16.8	6.7	26.3	11.9
11th-12th grade	5.8	0.5	13.6	5.5	15.3	5.2
Upstate New York	6.4	2.3	17.9	9.7	21.3	10.1
7th-8th grade	6.3	2.7	20.2	13.0	27.0	15.6
9th-10th grade	6.6	2.3	18.2	9.8	22.8	10.3
11th-12th grade	6.2	1.9	14.7	5.9	13.5	4.1

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[c]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[d]Source: N.Y State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

[e]The counties of Nassau, Suffolk, Westchester, Rockland, Ulster, Putnam, Orange, and Sullivan.

[f]The remaining counties in the State.

is suspected that recall may be a problem for these upper graders particularly if use of solvents was short-lived.

Solvent Use and Age

The relationship between age and solvent use is further refined in table 2. Again, the pattern is maintained across the years that younger students, especially those in their early teens, are more likely to have used solvents. What is interesting, however, is the increase of rates of use among those 18 years old and older between 1978 and 1983, confirming some mention in the literature that solvent use may be spreading to adults as well (Hershey and Miller 1982). In 1978, 2.9 percent of the males, 18 years and older, were recent solvent users compared to 5.3 percent in 1983; among females, 18 years and older, the comparable rates were 1.8 percent and 4.5 percent, respectively.

Solvent Use and Gender

The relationship between sex and solvent use is similar over time with only small differences in rates between males and females. Nevertheless, the findings over time show consistently that, despite the smallness of the differences, males almost always surpass females in rates of solvent use at each age.

Solvent Use and Ethnicity

Given the recent literature regarding solvent use among Hispanic youth, rates among the students by ethnicity were examined and were not included in the 1974-75 survey; only data for 1978 and 1983 are presented.

Although rates for solvent use were all higher in 1983 than in 1978, there were important contrasts among the students within each year and between years. In 1978, white males and females throughout the State had among the highest rates of solvent use, while black males and females in New York City had the lowest rates. Compared to white students attending school outside of New York City, black students also showed lower rates. Hispanic students, however, showed wide divergence within the State. In New York City, these students had intermediate rates of solvent use--higher than New York City blacks, but lower than whites. In the rest of the State, however, Hispanic females showed rates that were among the highest in the State (9.3 percent in the 6

months prior to the survey), whereas Hispanic males had rates that were among the lowest (1.6 percent). Tests of significance indicate that while Hispanic females were not significantly different from other female students in areas of the State outside of New York City, Hispanic males with their exceedingly low rate of solvent use were significantly different from their non-Hispanic male counterparts.

By 1983, while white male and female students continued to have the highest rates of solvent use among New York City students, Hispanic male and female students attending school outside of New York City had by far the highest rates of use in the whole State--more than one in five Hispanic students in these areas of the State had used a solvent for "kicks" or a "high" in the 6 months prior to the 1983 survey. Tests of significance indicate that these rates were significantly higher than the rates for their non-Hispanic peers. As for other youth, white students in the areas of the State outside of New York City showed little change over the 5-year period, with rates that were relatively low in 1983. Black females, irrespective of area in the State, had the lowest rates of solvent abuse.

A very small number of Native Americans were in the sample of secondary school students but were not enough to permit meaningful analysis.

Solvent Use and Academic Performance

The consistent finding in the literature and the finding in the 1974-75 survey of the relationship between poor school performance and solvent use was borne out by the subsequent surveys (table 4). There was a strong and consistent inverse relationship over the years between grade-point average and recent solvent use. At almost all grade levels, relatively large percentages of students who had either a "D" or an "F" average were recent solvent users. In 1983, more than one-third of the students in grade levels 7 through 10 who received an "F" average were recent solvent users.

Solvent Use and Family Cohesion

Since the 1983 survey did not include items to measure family cohesion, comparisons are made between 1974-75 and 1978. The 1974-75 survey included several items that probed degree of

TABLE 2

Comparison of Solvent[a] Use Rates Among Secondary School Students in New York State by Sex and Age 1974-75[b], 1978[c], and 1983[d]

Percent Who Used Solvents in the 6 Months Prior to the Survey

Sex and Age	1974-75	1978	1983
Males - Total	2.2	8.2	11.3
12 years or younger	2.6	11.7	14.6
13	3.1	11.5	13.9
14	2.4	10.2	16.0
15	2.7	8.6	12.4
16	1.4	7.0	9.0
17	1.2	5.0	7.2
18 years or older	1.3	2.9	5.3
Females - Total	1.6	7.6	9.9
12 years or younger	2.0	10.1	11.4
13	2.1	9.2	14.2
14	2.0	9.0	14.2
15	1.2	8.4	10.3
16	1.3	7.2	7.6
17	0.7	4.1	4.2
18 years or older	0.8	1.8	4.5

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[c]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[d]Source: N.Y State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

TABLE 3

Comparison of Solvent[a] Use Rates Among Secondary School Students in New York State by Ethnicity, Sex, and Area of the State 1978[b] and 1983[c]

Area of the State, Ethnicity and Sex	Percent Who Used Solvents in the 6 Months Prior to the Survey	
	1978	1983
New York City		
Hispanic		
Male	5.0	11.9
Female	4.6	7.8
White		
Male	7.9	15.3
Female	6.6	13.0
Black		
Male	3.5	7.6
Female	2.5	6.2
Rest of the State		
Hispanic		
Male	1.6	22.6
Female	9.3	25.5
White		
Male	9.6	10.1
Female	9.1	10.1
Black		
Male	5.8	13.4
Female	6.5	6.8

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[c]Source: N.Y State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

TABLE 4

Comparison of Solvent[a] Use Rates Among Secondary School Students in New York State by Grade Level and Grade-Point Average 1974-75[b], 1978[c], and 1983[d]

Grade Level and Grade-Point Average	Percent Who Used Solvents in the 6 Months Prior to Survey		
	1974-75	1978	1983
7th-8th grade	2.6	11.9	14.7
A	1.3	5.0	8.8
B	2.4	12.5	14.8
C	3.4	14.1	18.9
D	2.4	18.8	22.5
F	8.3	18.5	34.3
9th-10th grade	2.0	7.7	11.4
A	0.6	3.3	6.5
B	1.3	7.0	8.9
C	2.8	8.2	13.9
D	4.2	15.3	26.0
F	10.8	20.9	38.5
11th-12th grade	1.2	5.0	5.0
A	1.1	3.4	4.1
B	0.6	4.3	4.2
C	1.7	5.7	6.2
D	3.0	5.6	8.6
F	3.8	25.9	14.3

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[c]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[d]Source: N.Y State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

family closeness and which were used to construct a family-cohesion index. The 1978 survey simply asked, "How close do you feel to your family?" A comparison of rates of solvent use by these measures of family cohesion show very consistent findings (table 5). Irrespective of lifetime use or recent use, as family cohesion or closeness declines, solvent use increases. For instance, in 1978, 25.1 percent of the students who indicated that they were "not at all close" to their family were recent users of solvents, as compared to 5.8 percent of the students who answered that they were "extremely close" to their family.

Solvent Use and the Use of Other Drugs

The 1974-75 survey found that solvent use often reflected a more general drug-using pattern or polydrug pattern of use. Analysis of the subsequent surveys found a very similar pattern. Table 6 compares the number of substances ever used by solvent users across the three surveys, and the findings are fairly consistent--more than half of the solvent users have used two or more substances other than solvents and excluding alcohol.

Whether during lifetime or simply the 6 months prior to the survey, this pattern of polydrug use is evident (table 7). When particular substances are considered, alcohol and cannabis are consistently the most popular, followed in close order by stimulants, depressants, LSD, and narcotics. It should be noted that substances asked about individually in 1978 and 1983 were combined in categories to make them comparable to the 1974-75 survey. For instance, for the later surveys, the categories of stimulants and LSD also included cocaine and PCP, respectively. Furthermore, the use of prescription drugs asked about in 1974-75 did not specify nonmedical use; whereas in 1978 and 1983, only nonmedical use was queried.

A second finding in the 1974-75 survey was that solvents were most frequently the first substances used by solvent users (table 8). The subsequent surveys found this an increasing phenomenon. In 1974-75, 53 percent of the solvent users reported solvents as the first drug of use compared to 68 percent in 1978 and 77 percent in 1983. The mean age at which solvent use begins was very similar over the three surveys--about 12 years of age.

To elaborate the relationship between the using of solvents as a first substance and the eventual use of other substances, a

comparison is made of students using marijuana as a first substance with those using,solvents and marijuana as first substances during the same year (table 9). Although the likelihood of trying a variety of drugs is strong irrespective of first using solvents or first using marijuana, those who start with solvents are somewhat more likely to use narcotics and those who start with marijuana are more likely to use LSD and/or other hallucinogens as well as stimulants. Interestingly, those who start with marijuana are not nearly as likely to go to solvents as solvent first users are to go to marijuana. The most dramatic finding, however, is that those who initiate substance use with both solvents and marijuana in the same year demonstrate a very strong propensity to use a variety of drugs and enter an extremely serious pattern of drug use.

SUMMARY AND CONCLUSIONS

The major finding in the comparison of surveys of New York State secondary school students is the increasing use of solvents in this population over time. What in 1974-75 seemed to be limited use, by 1983 was found to be of widespread use.

Very much like the survey of 1974-75 and the findings in the literature, age of first use together with the recentness of use appears to cluster in the preteens or the early teen years and tapers off during the teen years. Of interest is the fact that, along with the general upward rate of use over the surveys, those 18 years or older also show an upward trend. Some evidence in the recent literature indicates that adults, too, are found to have a problem with inhalants.

Similar to the 1974-75 survey, but unlike findings in the literature, males and females continue to show similar rates of solvent use. Although males do generally surpass females in these use rates, the differences are usually not significant.

In light of the literature on solvent abuse among Hispanic youth, the 1978 and 1983 surveys indicated mixed findings. Hispanic students in New York City consistently showed intermediate levels of solvent use; whereas, in 1983, Hispanic students residing in areas of the state outside of New York City showed excessive rates of solvent use. To the extent that the problem of acculturation among poor Hispanic youth may contribute to solvent abuse, an explanation may be found in the contrasts between living in New

(Text continues on page 104)

TABLE 5

Comparison of Solvent[a] Use Rates Among Secondary School Students in New York State by Measures of Family Cohesion
1974-75[c] and 1978[d]

Family Cohesion Index[b]	1974-75 Solvent Use	
	% Ever used	% Used in Prior 6 Months
1 (most cohesive)	0.8	0.1
2	2.1	0.8
3	3.5	1.1
4	5.2	2.0
5	8.4	3.2
6 (least cohesive)	13.2	5.2
All Students	5.2	1.9

"How close do you feel to your family?"	1978 Solvent Use	
	% Ever used	% Used in Prior 6 Months
Extremely close	11.0	5.8
Fairly close	16.6	8.2
Not very close	28.6	16.4
Not at all close	42.2	25.1
All Students	15.2	7.9

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]An eight-item index constructed from the 1974-75 questionnaire.

[c]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[d]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

TABLE 6

Comparison of the Number of Substances Ever Used by Solvent[a] Users Among Secondary School Students in New York State 1974-75[b], 1978[c], and 1983[d]

Number of Substances Ever Used[e]	Percentage of Solvent Users		
	1974-75	1978	1983
Only Solvents	24	19	26
1 Other substance	22	24	21
2 Other substances	10	16	16
3 Other substances	11	12	13
4 Other substances	16	12	11
5 or More other substances	17	17	13
Total	100	100	100

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[c]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[d]Source: N.Y State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

[e]Alcohol is excluded in this analysis.

TABLE 7

Comparison of Use of Other Substances by Solvent[a] Users Among Secondary School Students in New York State 1974-75[b], 1979[c], and 1983[d]

Percent Who Ever Used

Solvents Ever Used	Alcohol	Depressants[e]	LSD[e]	Marijuana/ Hashish[e]	Narcotics[e]	Stimulants[e]
1974-75	98.3	49.7	31.5	74.4	30.4	50.0
1978	98.7	30.2	41.2	79.3	35.3	46.9
1983	94.9	31.4	21.9	61.2	39.9	47.2

Percent Who Used in Last 6 Months

Solvents Used In Last 6 Months	Alcohol	Depressants[e]	LSD[e]	Marijuana/ Hashish[e]	Narcotics[e]	Stimulants[e]
1974-75	87.7	42.3	24.8	69.9	34.6	51.1
1978	87.7	25.0	35.1	75.6	31.9	44.6
1983	91.3	29.9	17.8	54.8	36.2	44.3

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[c]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[d]Source: N.Y State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

[e]To make substance categories comparable to the 1974-75 survey, the following more specific substances were included: 1978 and 1983--LSD includes PCP, other hallucinogens; narcotics include heroin, methadone, other narcotics (e.g., codeine); stimulants include cocaine, amphetamines. 1983 only--depressents include methaqualone (Quaalude), other sedatives (e.g., barbiturates); hashish was not included.

TABLE 8

Comparison of Order of Solvent[a] Use Among Drugs Used by Solvent Users among Secondary School Students in New York State 1974-75[b], 1978[c], and 1983[d]

	Percentage of Solvent Users		
Order of Use	1974-75	1978	1983
No drug used before solvents	53	68	77
One drug used before solvents	34	20	14
Two drugs used before solvents	7	6	5
Three drugs used before solvents	5	3	2
Four or five drugs used before solvents	1	3	2
Mean Age of First Solvent Use	12.06 yr	12.80 yr	12.27 yr

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[c]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[d]Source: N.Y. State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

TABLE 9

Comparison of Students Who First Used Solvents[a] and/or First Used Marijuana and the Relationship With Other Substances Ever Used Among Secondary School Students in New York State 1974-75[b], 1979[c], and 1983[d]

Substance(s) Used First	Percent of Students Who Used This First	Depressants[e]	LSD[e]	Marijuana/ Hashish[e]	Narcotics[e]	Solvents	Stimulants[e]
Solvents used first 1974-75	2	23.4	13.7	44.6	14.3	100.0	23.1
1979	7	15.4	20.6	56.3	20.1	100.0	28.6
1983	12	22.7	12.0	44.2	32.9	100.0	35.0
Marijuana used first 1974-75	25	23.3	15.7	100.0	7.5	5.1	22.3
1979	42	17.0	31.2	100.0	17.4	10.8	29.9
1983	34	23.2	23.4	100.0	25.4	13.2	53.1
Solvents and marijuana used first 1974-75	1	58.5	35.4	100.0	36.7	100.0	56.3
1979	3	36.7	49.9	100.0	38.7	100.0	56.0
1983	2	45.3	35.6	100.0	49.1	100.0	68.3

[a]Solvents include glue, gasoline, paint thinner, etc.

[b]Source: N.Y. State drug and alcohol survey among a sample of 8,553 secondary school students, conducted by New York State Office of Drug Abuse Services, winter 1974-75.

[c]Source: N.Y. State drug and alcohol survey among a sample of 35,317 secondary school students, conducted by the New York State Division of Substance Abuse Services, spring 1978.

[d]Source: N.Y State drug and alcohol survey among a sample of 27,414 secondary school students, conducted by New York State Division of Substance Abuse Services, spring 1983.

[e]To make substance categories comparable to the 1974-75 survey, the following more specific substances were included: 1978 and 1983--LSD includes PCP, other hallucinogens; narcotics include heroin, methadone, other narcotics (e.g., codeine); stimulants include cocaine, amphetamines. 1983 only--depressents include methaqualone (Quaalude), other sedatives (e.g., barbiturates); hashish was not included.

York City and living in the rest of the State. In New York City, which has an extremely large Hispanic population (about 20 percent of the population), feelings of isolation and cultural distance may not be so profound. In the rest of the state, where the proportion of Hispanics is quite small (about 2 percent of the population), these cultural problems may be more of a factor. Reasons, however, for the extraordinary increase in solvent use among those Hispanic youth, specifically between 1978 and 1983, are difficult to offer.

Again, very similar to the 1974-75 findings, the 1978 and 1983 surveys found a strong relationship between solvent use and poor academic performance. Furthermore, the early findings relating to solvent use to a lack of family cohesion was supported by the 1978 survey where comparable information was gathered. The pattern of drug-using or polydrug use found among solvent users in the 1974-75 survey was underscored by the findings in the subsequent surveys. The indication in 1974-75 that those youngsters who began substance use with solvents were somewhat more likely to turn to narcotics than those who began substance use with marijuana was also demonstrated in 1978 and 1983. Those, however, who began by using solvents and marijuana in their first year of use--which was probably at a very young age of first use--had a strong likelihood of engaging in extreme polydrug behavior.

Interestingly, during the time period between 1978 and 1983, an additional category of inhalants other than the solvents became popular--amyl nitrites including "snappers" or "poppers," and butyl nitrites (e.g., products with such trade names as Locker Room and Rush). These products may have added some legitimacy to inhalant use. These products became popular across the country and especially New York State. For instance, a 1983 NIDA-sponsored survey of high school seniors (Johnston et al. 1984) found that 8 percent of the students had used amyl/butyl nitrites during their lifetime. The 1983 New York State survey included a separate question on the use of these nitrites and found that 19 percent of the high school seniors had inhaled these substances. It might be speculated that the growing popularity of solvent use in New York State might have contributed to the popularity of the nitrites or possibly vice versa. In any case, as of 1985, the sale of butyl nitrites for the purposes of inhalation is illegal in New York State. The effectiveness of the law is yet to be determined.

FOOTNOTE

[1]Although the analysis of the earlier survey did explore additional generalizations in the literature, including the influence of peer pressure and socioeconomic characteristics, the 1978 and 1983 surveys did not address these issues; and, consequently, this discussion is omitted.

REFERENCES

Beauvais, F. Trends in the use of inhalants among American Indian adolescents. White Cloud J Am Indian Mental Health 3(4):3-11, 1985.

Bonnheim, M., and Korman, M. Family interaction and acculturation in Mexican-American inhalant users. J Psychoactive Drugs 17(1):25-34, 1985.

Dworkin, A., and Stephens, R. Mexican-American adolescent inhalant abuse: A proposed model. Youth and Society 11(4):493-506, 1980.

Hershey, C., and Miller, S. Solvent Abuse: A shift to adults. Int J Addict 17(6):1085-1089, 1982.

Johnston, L.; O'Malley, P.; and Bachman, J. Drugs and American High School Students 1975-1983. National Institute on Drug Abuse. DHHS Pub. No. (ADM) 85-1374. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1984.

Stephens, R.; Diamond, S.; Spielman, C.; and Lipton, D. Sniffing from Suffolk to Syracuse: A report of youthful solvent use in New York State. In: Sharp, C.W., and Carroll, L.T., eds. Voluntary Inhalation of Industrial Solvents. National Institute on Drug Abuse. DHEW Pub. No. (ADM) 79-779. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1978. pp. 23-40.

Weibel-Orlando, J. Substance abuse among American Indian youth: A continuing crisis. J Drug Issues 14(2):313-335, 1984.

AUTHORS

Blanche Frank, Ph.D.
Rozanne Marel, Ph.D.
James Schmeidler, Ph.D.
New York Division of Substance Abuse Services
Bureau of Research and Evaluation
55 West 125th Street
New York, New York 10027

Program Experiences With the Solvent Abuser in Philadelphia

Terence M. McSherry, M.S.P.H., M.S.P.A.

SITUATION

In the period 1976-77, the latter stages of what could be termed the formative period of the city-wide drug treatment system in Philadelphia, the need for a program focusing on persons abusing solvents was identified. The plan developed in 1976 by the Coordinating Office for Drug and Alcohol Abuse Programs (CODAAP) states in part:

> There is evidence to suggest that there is a serious solvent abuse problem among adolescents and young adults in the Kensington-Fishtown area of the city. Although several mental health centers and various drug treatment programs service this area, the problem persists with indications that traditional modes of drug treatment do not significantly impact on this problem. . . . The District Attorney's Office, the Public Defender's Association, and the Police Department in Philadelphia have expressed concern over this problem for the past several years. It is apparent, at least in Philadelphia, that a problem exists and that it is not primarily the "stuff of kids." In 1974, 290 adults were arrested (over 18) and in 1975, 301 were arrested for the illegal use of solvents. In the first nine months of 1976, another 249 adult arrests for solvent use were made by Philadelphia Police. The court system, in particular the District Attorney's Office, has been at a loss as to how to deal with these cases and

these offenders. Eighteen months ago the court asked informally that CODAAP's NEXUS Program accept these cases for diversion and try to treat them, or in their words "do something for them." (Coordinating Office for Drug and Alcohol Abuse Programs 1977, pp. 18-19.)

The NEXUS Program is a criminal justice diversion program which refers patients to appropriate facilities for treatment and tracks them. The CODAAP plan goes on to state in part:

> The NEXUS Program has isolated 90 individuals with whom they have worked over the past year and a half (1976-1977), and whose primary drug of abuse is the use of solvents. The following tables describe the general characteristics of the population.

TABLE 1 - AGE

Years of Age	Number in Sample
18	10
19	26
20	20
21	11
22	5
23	8
24	3
25	1
26	4
27	2

TABLE 2 - RACE AND SEX

Race and Sex	Number in Sample
White Males	71
White Females	10
Hispanic Males	6
Black Males	3

TABLE 3 - EDUCATION

Last Grade in School Attended	Number in Sample
0	1
6	3
7	4
8	4
9	11
10	28
11	21
12	4
Completed High School	5
Information not Available	19

TABLE 4 - EMPLOYMENT

Employed Full or Part-Time	11
Unemployed	79

After looking at the characteristics of this group, we plotted the neighborhoods in which these individuals live. Chart 1 on the following page pinpoints these areas. The heavy line defines the basic geographic area and the number of individuals in our sample from each neighborhood. It is readily apparent that this problem is localized or concentrated in the Kensington-Fishtown area of the city.

Some of our conclusions from this preliminary study are that solvent use as a pattern of drug abuse exists in Philadelphia; the problem is localized and easily recognizable in one section of the city and within a certain population within those areas; that the problem, although highly prevalent among the young, reaches beyond and into the young adult population; and these individuals have real and observable social and

CHART 1

1978 Distribution of Primary Solvent Abuse Patients in Nexus

117

physical problems and that traditional forms of treatment do not significantly impact on these problems.

One other point should be mentioned. There seems to be some indication that solvent abusers do not seek treatment voluntarily. Although the information to support this is scarce, some exists. According to a previous UDCS report which studied total admissions to drug and alcohol treatment and principal drug of abuse for a two month period (December 1975 - January 1976), of 2,612 new admissions, only 0.5 percent or 13 individuals cited inhalants as their principal drug of abuse, and only 0.8 percent or 21 individuals mentioned inhalants as a problem. (Coordinating Office for Drug and Alcohol Programs 1977, pp. 1-2)

Based on the above information, it was determined that a program to address the treatment needs of this group should be developed. Accordingly, a contract for $27,000 for a 6-month period was let to Lower Kensington Environmental Center, Inc. (LKEC) in January 1978.

LKEC

Lower Kensington Environmental Center, Inc., is a nonprofit corporation established in 1970. The original program was an alternative school located in the lower northeast section of Philadelphia. Evolving from the education-oriented beginning, LKEC developed over time an enduring network of addiction treatment programs and services for youth in Philadelphia and in the State of Delaware. As of this writing, two residential therapeutic communities of 55 beds and three outpatient addiction services are operating in Philadelphia, as are two group homes, a satellite network, and an in-home detention program for young people involved with the criminal justice system. LKEC operates a 12-bed drug residential program, a 33-bed detoxification program, and a 60-bed, 28-day addiction rehabilitation program for adults in Delaware, as well as a residential treatment program for emotionally disturbed youth.

Area Served

While available to residents in all sections of Philadelphia, the Solvent Abuse Project has historically received few referrals for service originating beyond the area outlined in the accompanying map of the city.

Philadelphia has been accurately described as "the city of neighborhoods." The area in which solvent abusers have mainly lived is the Kensington and Fishtown neighborhoods. These are neighborhoods that were linked economically with the waterfront industrial network, attendant light and medium industrial manufacturing and processing companies, packaging and transport enterprises, and meat packing facilities. It is predominately white (although Hispanic immigrants and some blacks are present, especially from the latter part of the 1970s) and is ethnic in its origins (Irish, Central and Eastern European) and in its identifications.

This area has been hard hit economically since the 1960s. Outmoded and inadequate physical facilities and all the myriad factors associated with "urban blight" are present. Unemployment is high; crime rates are high; the education system is overburdened; dropouts rates are above normal; and alcoholism, drug abuse, and child abuse are far too frequently encountered. This area has acquired the reputation as the "speed capital of the east coast" which only reflects an area of specialty, not the sole drug of choice.

THE SOLVENT ABUSE PROGRAM--DESIGN AND HISTORY

The program has gone through a series of evolutions since it was first conceived, driven by deteriorating funding, as much as by experience with the target population. The program, established in 1978, had a strong "streetwork" component and paid a great deal of attention to gathering information on solvent abusers in the neighborhoods--who they were, what their lifestyles and circumstances of life were, what might motivate them to seek treatment, and what treatment approaches might be effective. Areas where solvent abusers congregate were identified. Data on theft patterns from area businesses that use solvents were gathered, as was information from area civic, religious, and community organizations.

The solvent abuser was known to be resistant to coming into the traditional treatment modalities. The approach used was to, in a sense, "infiltrate" the solvent-abusing subculture through casual contacts on the street and participation in activities. After the development of some linkages and trust, the streetworkers would attempt to enroll the abuser in outpatient activities in a specific area of LKEC's clinical units.

The outpatient treatment itself was unique in that it emphasized a very nonintrusive therapeutic style as well as supportive, tension-relieving group activities. A great deal of emphasis was placed on making transportation available to clients, picking them up if necessary. Within the unit, concrete active alternatives to solvent abuse were provided frequently, such as educational, athletic, and socialization experiences. Every effort was made to present an open, low key, drug-free alternative for a large part of the day. Over the next 2 years, outreach into area schools was added as a program service and case-finding mechanism.

This approach eventually ran counter to the fiscal realities of operating drug programs in the 1980s. Falling levels of support, internal problems in other parts of LKEC, and increased emphasis on revenue generation from medical assistance led to the adoption in Fiscal Year (FY) 1983 of a more classical outpatient model for the program. Streetwork ended, outreach into the school was curtailed as was transportation, and patients were seen more often by regular appointment. Attempts to maintain ongoing contact by letter and phone were made, with less success than experienced previously.

In FY 1985, as part of a general cost-cutting reorganization, the solvent abuse program, which had had its own separate location, was integrated into another LKEC program. This newer unit, the Community Counseling Center, had long treated a wide range of drug abusers on an outpatient basis. While no serious conflicts have arisen, and service levels have been maintained, a definite blending has occurred.

While no active outreach is done, the fact that LKEC has clinical experience in treating the solvent abuser is known to social service agencies and the abusers themselves. This results in a continuing number of new cases and "return" cases. All the counseling staff receives specialized training in solvent abuse as part of its

orientation. Within the available space and resources, socialization and group interaction are encouraged, and a generally informal atmosphere prevails. A daily program more resembling a "day hospital" setting than an "appointment only" clinic is in operation and appears effective for both the traditional and the solvent-abusing patient from this area.

Observations About the Solvent Abuser

The following are observations about the solvent abuser population seen by LKEC staff since program inception in 1978 to the present. The available information is limited and not amenable to accurate numeric summary. These observations are based on internal written reports in 1979, 1980, and 1981; on yearly citywide Uniform Data Collection System (UDCS) statistical reports published by the Coordinating Office for Drug and Alcohol Abuse Programs; on conversations with present and past staff members of LKEC's Solvent Abuse Project; and on a brief review of illustrative cases. A 1979 report (LKEC, Inc., Solvent Abuse Research) focusing on 51 solvent abusers in treatment over the previous year used the following typology:

Experimental
The abuser has under 2 years of experience with solvents and the use is sporadic. There is little criminal activity and other drugs are used as often as solvents. Age range is generally 14 to 17 years.

- 20 percent of the treatment population

Acute Abuse
The abuser has been using solvents for 2 to 4 years. Use is at least three times weekly. There is some involvement with petty criminal activity. Solvents are the predominant drug of choice, although other drugs are also used. Age range is 17 to 21 years.

- 20 percent of the treatment population

Chronic Abuse
This patient has been using for 5 to 15 years. The drug of preference is toluene, which is used daily and for extended periods of the day. Drug-related criminal activity is at a somewhat higher level. Psychologically addicted with

physical signs of deterioration. Age range is 20 to 28 years of age.

- 51 percent of the treatment population

The median first age of use of the total group was 13 years. Only 32 percent of the group was in treatment as a direct result of criminal justice system action. Educationally, 85 percent had not completed high school, compared to 39 percent in their age group overall. Sixty-nine percent of the group had dropped out by age 16. While in school, they exhibited poor performance and high truancy rates. Vocationally, 10 percent were employed. Public assistance, prostitution, and petty crime were the prime means of support.

Females accounted for 24 percent of the treatment population, and a high number of those in treatment had a dysfunctional family situation with an absent parent, a drug- or alcohol-abusing parent, and a high rate of solvent use by siblings. Little success has been noted in getting the families of solvent abusers into the treatment process. Whites accounted for 97 percent of those in treatment at that time.

The following findings are drawn from a series of internal reports, staff discussions, and case reviews. As a practice, solvent abuse, or "huffing," is reported as usually taking place in small groups of three or more, with leadership being provided by the individual supplying the site or the solvent (frequently both). There is reported to be acceptance into these groups but without trust or any form of mutual respect. A great deal of intimidation as well as physical, mental, sexual, and financial abuse among members takes place. Solvent abusers "seem to have a rather bizarre comradeship in which they will usually cover for each other in confrontation with authority, while on the other hand they will take advantage of each other at every instance." (LKEC, Inc., Solvent Abuse Research 1979.)

Little support for each other entering treatment is noted, as is a pattern of prejudice against abusers of other drugs and the so-called "straight" world. Existing in small groups based on geographic "turf" or age levels, solvent abusers have developed a specialized jargon of their own.

From a physical point of view, the chronic solvent abuser as seen in treatment at LKEC is underweight, has unusually poor personal hygiene, and has poor dental status. Body lice are frequently encountered, and 4-day intervals between bathing and clothing changes are not uncommon. Their speech is frequently slow and slurred; and trembling in their hands, feet, and eyelids is common. Their thought processes are slow; attention span is short; and short- and long-term memory functions are impaired, usually in direct relation to length and frequency of use of solvents. Almost all patients have major physical problems by the chronic use stage, with liver and kidney diseases being prominent and neurological problems being seen often.

Solvent abusers are seen by our staff, who work with abusers of other drugs, as quite dissimilar. Chronic solvent abusers are seen by other abusers as low status, "losers." Solvent abusers appear to suffer much more severe psychological impairment, although whether this impairment precedes the abuse or is a result of it, is unclear. The chronic abuser is less verbal and is much less sophisticated or "streetwise."

Before going on, it is important to put the solvent abuse problem into some sort of geographical and numeric perspective. In the Kensington-Fishtown area, the use of solvents at an early age is fairly common. After alcohol, it is the earliest used drug for many patients who eventually get involved in treatment (and undoubtedly, for many who don't). It is easily obtained, is inexpensive, and, paradoxically, is not identified as a "drug" by the community. It would appear, from our experience, that most persons who end up with addiction problems use alcohol first, then glue or toluene, then marijuana, and then move to the other drugs experimentally, and then abusively. Solvent abuse, therefore, is seen by the street culture as "kid stuff," something to be tolerated in the young, but to be set aside in the later teenage years.

Even among solvent users in treatment in 1986 at LKEC, there is a differentiation to be made. Of 40 people in treatment, a quick survey indicated that 38, while users of solvents, also used or had used other drugs as well. Only two used solvents exclusively, and they fit the "classic" mold described above. The percentage of these latter types of patients that were in treatment was also steadily declining. Whether this is due to a change in drug use

patterns or to a lack of "fit" between services offered and the population's need, or to other factors, is unknown.

TREATMENT IMPLICATIONS

Reports, both formal and anecdotal, and review of case records over the past 7 years give a composite of the habitual, chronic solvent abuser which has implications for the design and operation of a treatment program.

The solvent abuser is predominantly a social isolate. Drugs are used in small, fragmented groups or alone. In some cases, ritualistic family use has been noted; as the alcohol-abusing family may drink together, the solvent-abusing family may "pass the rag." Solvents are available, are inexpensive, and require few social skills and minimal planning to obtain or use. In neighborhoods where solvents are socially sanctioned, sniffing a rag on the street corner draws as little attention as sipping the bottle on skid row. Sexual relationships are generally immature and transitory, and most potential partners are repulsed by the user's odor and typically very poor hygiene. Despite this, however, solvent abusers--usually young and of both genders--are often targets and passive victims of rape and sexual abuse perpetrated by members of the nonsolvent-dependent community, as well as by fellow huffers.

Most chronic abusers are unable to read and write at a literate level. They have difficulty negotiating transportation networks, buying food, and handling many basic life-management tasks. They often spend periods of time on the street and in vacant cars and houses. Even simple employment has long since been lost as an option. They are notorious "no-shows" for appointments and will often show up on the wrong day or at the wrong time. Information retention, ability to plan for the future, and motivation are all low.

Related physical deterioration adds to the socially repulsive image of the solvent abuser. In addition to very poor physical hygiene, chronic users present severe dental problems and also skin rashes from holding rags to their face and from poor hygiene. Their gait is unsteady and speech is slurred; and Parkinson-type tremors of the face and appendages are common. Many report hearing and vision problems. Damage to liver and kidney, and symptoms related to potassium imbalance, have been medically documented

in many cases. The physical symptoms above are likely to reflect neurological damage which does not seem to clear a lot with abstinence, although some improvement has been demonstrated over long periods of time. Impairment in short-term memory is prevalent, as well as increasingly concrete thinking.

Clinical staff also have observed that chronic solvent abusers seem to function as victims in a more passive manner than the typical self-defeating behaviors seen in drug addicts in general. Many clients reported physical, emotional, and sexual abuse by family members, often including rape and incest, and reported this in a manner suggesting this is their accepted role in the family. Criminal behavior is usually limited to misdemeanors and nonaggressive crimes. However, a large percentage of clients did demonstrate sporadic explosive behavior and aggression, mostly when intoxicated and provoked. It is also interesting to note that characteristic ideations amongst chronics frequently involved fire and flying; and some cases of clients involved in arson and jumping off of bridges or buildings while intoxicated were noted.

Also of interest is that solvent abusers do not consider themselves to be drug abusers. They will emphatically state, "I don't do drugs, I just use tywol" [toluene]. This extreme resistance to being identified as a drug addict has clear treatment implications (to be discussed).

A program that will successfully deal with the chronic solvent abuser must take into account all of the deficits the client brings with him or her. As implied from the above profile, these clients require more intensive care than other drug addicts or even perhaps the chronic homeless alcoholic.

The clinic setting must be warm, open, and nonthreatening. Space and time for informal socialization and recreation are crucial. Although LKEC no longer has this resource, we believe that "streetwork" (i.e., seeing and talking to solvent abusers in their neighborhood) is an important component in engaging these clients. The familiarity of the staff with the client and his or her living situation increases visibility and the client's access to services. Similarly, it is important that the clients' recidivist behavior be tolerated to some extent. Most clients make numerous appointments and attempts at treatment before becoming engaged in the process. Due to lapses of memory and limited cognition, clients have difficulty just getting to the clinic, much less on time

or with consistency. While in most addiction programs this would be considered enabling, we believe, as some would also maintain in the case of the chronic alcoholic, the revolving door is necessary.

A related issue is, in our experience, the inability of the solvent abuser to respond to a traditional disease concept course of treatment. Not only do they resist identification as drug addicts (as mentioned above), but the cognitive demands of the typical recovery model are beyond the grasp of most clients. Thinking is too concrete and needs are too basic. We've found clients unable to utilize typical support, such as Narcotics Anonymous or Alcoholics Anonymous, especially initially when they still for the most part are demonstrating intoxicated-like behavior and personal hygiene problems.

Initial engagement strategies need to appeal to such basic needs as warmth, food, and human contact. It is also important to understand the often paranoid, hostile, and passive-aggressive behavior displayed during this period. Our experience is that new clients often test staff intensely, trying to provoke the rejection they are familiar with and in ways that go beyond the early resistance normally exhibited by new addicted clients. As a relationship begins to develop, initial treatment goals must be basic, such as keeping appointments, tolerating the environment, and simple self-disclosure. Treatment must be positively reinforcing of the smallest demonstration of more appropriate behavior; insight-oriented therapy will have limited impact. As the relationship with the counselor and the treatment setting strengthen, inhalant abusing clients frequently become unusually dependent, using the program to reconstruct a family environment more concretely than the typical addict. An important component of treatment in all phases must be both informal and structured socialization and recreation. A day program or partial hospital model would be optimal. As soon as the therapeutic relationship will tolerate it, thorough physical, psychiatric, and psychosocial evaluations must be done. Given the kinds of damage observed in chronic solvent abusers, access to quality medical and psychiatric services is crucial.

Much of the treatment will also entail endless social work linking clients with these services as well as many others. These clients need more than the usual assistance in keeping appointments and negotiating the red tape of social service systems. They often do

not have a clear understanding of their legal status and need help in following through with probation obligations or legal proceedings.

Families are typically resistant to treatment, enable the clients' solvent abuse, and, in many cases, overtly sabotage treatment. Again, unlike the drug addict who often acts out against family dynamics, the solvent abuser more passively accepts his or her role and needs more assistance in separating from the family. This is also a crucial issue in the therapeutic "family" relationship. Many clients become overwhelmed as individuation becomes the issue. Rarely are they competitive in the job market on even a menial level, and solvent-related physical and mental damage often requires retraining in very basic tasks. In addition to learning to read and write functionally, clients need more basic retraining in life management skills than usual; and they sometimes need rehabilitative work on psychomotor functions and special education addressing memory loss and cognitive functioning. It is still a question as to how much damage is permanent and what areas of function can be improved. Needless to say, this is a long-term process requiring extensive resources. Individuation becomes extremely difficult if the client cannot function autonomously to some extent. As with our programs, most do not have these resources and we have watched many clients go back to using solvents when they could not negotiate the complexities of independent living.

As described above, it appears that the most appropriate model of treatment for these clients is really an adaptation of a mental health, social rehabilitation model, structured as a day or partial hospital program. Ideally, staff should be trained in mental health-oriented approaches, including both behavioral therapy and developmental concepts. Chronic solvent users most often have histories that include family sexual abuse and severe family dysfunction; most are more developmentally arrested and have less ego strength than the typical drug addict. Counselors need to know how to address these issues in ways that require less insight than perhaps is the norm for these types of specialized treatment issues. A realistic option might be coordination of services with programs specializing in sexual abuse or family issues. Similarly, knowledge of various rehabilitative approaches is also needed, and perhaps linkage with sheltered workshop programs is appropriate in some cases.

REFERENCES

Coordinating Office for Drug and Alcohol Programs. Comprehensive Plan for Drug and Alcohol Treatment and Prevention, Fiscal Year 1977.

LKEC, Inc., Solvent Abuse Research Project. Progress Report, April 1979.

ACKNOWLEDGMENTS

The LKEC Solvent Abuse Program was funded under contract number 8-9-3910, Coordinating Office for Drug and Alcohol Abuse Programs, City of Philadelphia.

Mark Bencivengo of CODAAP, Lucy Pennington, and especially Patricia Rice assisted in data collection and analysis.

AUTHOR

Terence M. McSherry, MSPH, MSPA
Executive Director
LKEC Treatment Services, Inc.
2205 Bridge Street
Philadelphia, Pennsylvania 19137

128

Inhalant Use and Abuse in Canada

Reginald G. Smart, Ph.D.

INTRODUCTION

Inhalant use in Canada has not had a very long history. Cases of inhalant use were reported in the 1940s and 1950s in the United States but, in Canada, the first cases were reported in 1964 by Gellman (1968). A pharmacist in Winnipeg noted that young people were stealing large amounts of a particular brand of nail polish remover and inhaling the fumes for "kicks." There were early unconfirmed reports that students were drinking a mixture of cola drinks and nail polish remover. However, soon a half dozen young "glue sniffers" were brought to the Winnipeg Poison Control Centre. After that, sporadic reports came from most large Canadian cities that glue and solvent sniffing were common, at least in some schools. Usually, glue and solvent abuse have been relatively small problems in Canada. However, gasoline sniffing has been an epidemic of major proportions on many Indian reservations and among some urban Indians as well. Gasoline sniffing has had devastating effects on some Indian bands and has sometimes involved almost all members of the bands. In addition, "poppers" or nitrites are used by homosexuals. However, it has been impossible to find cases of voluntary or recreational use of industrial or anesthetic gases in Canadian journals, at least in the past 40 years. Cases must exist within the country but perhaps have not been reported in the scientific literature.

There are a variety of information sources for inhalant use in Canada. Some student drug use surveys include relevant questions. Poison control centres gather data on cases coming to their

220-583 0 - 88 - 5 : QL 3

attention. Treatment centres also have information on the characteristics of users seeking treatment. In addition, there have been several interesting observational and survey studies of Indian reservations both with and without problems. Various reviews of solvent abuse have been made but usually they include very few studies from Canada (for exceptions, see Smart 1986; Barnes 1979). Much of the available data is in unpublished reports or government documents which are difficult to obtain. However, a few clinical case history studies and some surveys have been published.

"POPPER" OR NITRITE USE

Nitrite or "poppers" include amyl nitrite and butyl nitrite products which are usually sold to relieve the pain of angina pectoris. They come in fragile glass ampoules which can be crushed or "popped" in the fingers and then inhaled--hence, the term "poppers." Butyl nitrite was not covered by the Food and Drug Act in Canada and, hence, could be legally sold until 1985. These drugs were sold as "odorizers" or "incense" in homosexual bars, discotheques, and steam baths and in "head shops." (They carry such alluring names as "Rush," "Locker Room," and "Thrust.") Their main effects are vasodilation and a short high, and users believe them to enhance of sexual performance. A survey in 1978 (Israelstam et al. 1979) in Toronto indicated that 63 of 70 male homosexuals used "poppers" about twice a week on the average. In the past 5 years, three patients have been admitted to treatment at the Addiction Research Foundation in Toronto with a primary drug problem involving nitrites.

Since the sale of butyl nitrites has been made illegal, it is thought that use has dropped substantially. However, nitrites can still be bought in some American states adjacent to Canada and some homosexuals are continuing to use them. There is some evidence that heavy users of "poppers" may be more likely to run the risk of getting AIDS. As this is widely known in the homosexual community, it probably contributes to limited use of the drug as much as the new legislation does.

INHALANT USE IN GENERAL POPULATIONS

Use in Student Populations

Because inhalants are less popular than other drugs, such as cannabis and psychotropics, there are few studies of their use in large populations. However, some large, representative sample studies in Canada do give trend data (table 1). Since the way the questions were asked and the sampling methods varied from one study to another, comparisons of the percentage of users should be cautiously interpreted.

Current use of solvents varies from one study to another. For example, Hollander and Davis (1983) in 1982 found that, in the past 6 months, 6.2 percent of students in Vancouver used solvents compared to 3.3 percent in Prince Edward Island (Killorn 1983). In Ontario in 1983 (Smart et al. 1985), 3.2 percent reported use of glue while 4.1 percent used other solvents in the past 12 months. In all Canadian studies of students (except for native populations --Indians and Inuits), solvents are much less often used than alcohol, cannabis, or hallucinogens. Rates of use among students are lower than among dropouts and, hence, the school studies underreport use. For example, Annis and Watson (1975) found that 17 percent of early dropouts used glue and other solvents compared to only 7 percent of those remaining in school.

Frequency of Solvent Use

Usually, solvent and glue users in student populations take these substances infrequently unless they are in a specially selected heavy using group, such as those in treatment. In the 1985 Ontario school study, 79.9 percent of glue users and 77.4 percent of solvent users reported using the substance only once or twice in the previous 12 months (Smart et al. 1985). In 1983, only 1.3 percent of glue users and 1.5 percent of solvent users reported using 40 or more times. However, in 1985, no students reported using 40 or more times (table 2). In fact, glue and solvents were the least frequently used drugs of any type. For example, in 1983, 6.4 percent of cannabis users, 20 percent of alcohol drinkers, 16 percent of heroin users, and 7.2 percent of LSD users reported using those substances about 40 or more times per year.

Solvent/inhalant abuse is recognized as predominantly an adolescent problem, and no study in Canada has been done

TABLE 1

Trends in Percentage of Solvent Use Reported by Students in Canada

Reference	Years	Grade Level	Prevalance			
			Ever Used	Past 12 Months	Past 6 Months	Past 30 Days
Hollander and Davis 1983[1]		8-12th Grades				
	1970	n = 2,496	8.8			
	1974	n = 1,732	9.3		3.9	
	1978	n = 1,806	10.3		4.4	2.8
	1982	n = 1,701	19.2		6.2	3.7
Killorn 1983[2]		7 - 12th Grades				
	1972	n = not stated			2.3	
	1976	n = not stated			4.2	
	1982	n = 1,559			3.3	

Reference	Years	Grade Level	Ever Used	Prevalance Past 12 Months	Past 6 Months	Past 30 Days
Smart, et al., 1985[3]		7, 9, 11, and 13th Grades				
	1977	n = 4,687		3.9* 6.6**		
	1979	n = 4,794		4.3* 6.2**		
	1981	n = 3,270		2.3* 3.2**		
	1983	n = 4,737		3.2* 4.1**		
	1985	n = 4,154		2.0* 2.7**		

* = Glue
** = Solvents
[1]Vancouver
[2]Prince Edward Island
[3]Ontario

TABLE 2

Trends in Percentage Reporting Frequency of Glue and Other Solvent Use in the Past 12 Months Among Total Ontario Students and Among Users

	Glue				Other Solvents			
	Total		Users		Total		Users	
Frequency	1983	1985	1983	1985	1983	1985	1983	1985
None	96.8	98.0	--	--	95.9	97.3	--	--
1-2 times	2.6	1.6	81.2	79.9	3.0	2.1	72.8	77.4
3-5	0.3	0.2	9.6	8.7	0.6	0.4	14.8	16.1
6-9	0.2	0.1	5.4	4.3	0.2	0.1	4.7	3.9
10-19	0.1	0.1	1.6	5.7	0.2	0.1	4.4	1.9
20-39	0.0	0.0	0.0	1.3	0.1	0.0	2.1	0.7
40+	0.0	0.0	2.2	0.0	0.0	0.0	1.2	6.0

concerning solvent use among general adult populations. However, Smart (1983) found that 4 percent of cases of solvent abuse seen at poison control centres in Canada were aged 25 and over. Several studies of Indian groups, to be discussed later, mention use among adults as well as children. However, no good estimate of solvent or inhalant abuse among adults seems to be available for general populations.

Trends in Solvent Use in Canada

Only one survey, reported in table 1, shows an upward trend in solvent use over the past few years. Solvent use increased considerably in Vancouver between 1974 and 1982 (3.9 percent versus 6.2 percent, respectively, used in the past 6 months). The Prince Edward Island study shows a peak in 1976 and a decline by 1982. The Ontario study shows a peak in 1977 for glue and solvents and a general decline by 1985 to levels less than half of those for 1977 (4.3 percent to 2.0 percent and 5.8 percent to 2.3 percent, respectively). Glue and solvents have shown the largest declines in overall use of any drugs used by students.

Characteristics of Solvent Users

Solvent users are typically very young. The study in Vancouver found that solvent use was most common among those 14 years of age and under. The peak for solvent and glue use among Ontario students (table 3) has always been 13 or under. By the age of 18, virtually all solvent or glue use has disappeared among students.

Most studies show that males predominate among solvent users. Inhalant use was much more common among males in a study of Canadian Indian communities and among treatment populations in Toronto. Among Ontario students in 1985, rates of use were about one-third higher among males than females. Surprisingly, Hollander and Davis (1983) in Vancouver found solvent use rates to be about the same among males and females.

Psychosocial problems and disturbed behaviour among solvent users have not been much investigated except for delinquency. High school inhalant users in the Ontario study far more often reported violent crime, thefts, and selling drugs than did nonusers. The Ontario school study also enquired about five specific problems. Only 4.8 percent of solvent users had been arrested or warned by police because of their drug use. About the same

TABLE 3

Trends in Percentage of Ontario Students Reporting Glue Use at Least Once During the Prior Year

Variable		Year				
		1977 (N=4687)	1979 (N=4794)	1981 (N=3270)	1983 (N=4737)	1985 (N=4154)
Total		3.9 ±2.8	4.3 ±2.7	2.3 ±0.5	3.2 ±0.4	2.0 ±0.4 ***
Sex	Male	4.5 ±4.0	5.8 ±3.8	2.3 ±0.7	3.8 ±0.8	2.3 ±0.7 **
	Female	3.2 ±3.8	2.7 ±4.0	2.2 ±0.9	2.7 ±0.7	1.7 ±0.3 **
Grade	7	6.5 ±5.3	7.4 ±5.3	3.7 ±1.9	4.7 ±0.8	3.1 ±0.9 *
	9	4.0 ±4.8	5.0 ±4.8	3.0 ±0.7	4.0 ±0.8	2.5 ±1.0 *
	11	2.1 ±5.9	2.1 ±5.8	1.3 ±0.6	1.6 ±0.9	1.1 ±0.4
	13	1.8 ±7.1	1.5 ±6.5	0.2 ±0.3	0.4 ±0.3	0.4 ±0.6
Age	≤13	6.1 ±5.2	7.1 ±5.4	3.4 ±1.8	4.7 ±0.9	3.1 ±0.9 *
	14-15	4.1 ±4.8	5.0 ±4.8	3.1 ±0.7	4.0 ±0.8	2.4 ±1.0 *
	16-17	2.1 ±5.7	2.3 ±5.5	1.6 ±0.6	1.6 ±0.8	1.5 ±0.4
	18+	2.0 ±7.5	1.9 ±6.8	0.1 ±0.2	0.8 ±0.6	0.4 ±0.5
Region[1]	Metro			1.6 ±0.6	2.2 ±1.5	2.1 ±1.4 ***
	West			2.6 ±0.3	4.2 ±0.4	2.2 ±0.4 *
	East			2.1 ±1.0	2.7 ±0.6	1.7 ±0.5
	North			3.4 ±3.3	3.3 ±1.8	1.6 ±1.3

* $p < .05$; ** $p < .01$; *** $p < .001$.

[1] Regional stratification differed in 1977 and 1979 and, therefore, are not presented.

proportions had medical treatment (3.1 percent) or had discussed their drug problems with school counsellors, nurses, or teachers (3.4 percent). Few (4.0 percent) also reported that their parents thought they used drugs too often. However, far more (18.3 percent) said that they wished to use drugs less than they did at the time of the survey. In the aggregate, only 50 of 148 solvent users reported any problem but some reported more than one. Few problems seem to arise from solvent use if it is infrequent.

Inhalant users are often users of many other drugs. In the Ontario school studies, users of alcohol, cannabis, and medical tranquillizers were twice as likely to use solvents as nonusers of these drugs. Users of such drugs as barbiturates, heroin, amphetamines and other stimulants, LSD and other hallucinogens, and cocaine were three to six times as likely to have used solvents in the past year.

Some studies have been made of psychological characteristics of high school inhalant users. For example, Fejer and Smart (1972) found that glue users had much higher scores on a scale of clinical anxiety than nonusers. Many had also been treated for psychological problems. Adlaf and Smart (1983) found no differences between glue or solvent users and nonusers on a risk-taking scale. Not surprisingly, Annis and Watson (1975) found glue users to be lower in self-acceptance and acceptance of others than were nonusers.

INHALANT ABUSE AMONG CANADIAN INDIANS

There are about 400,000 Canadian Indians of whom about 35 percent live in urban areas, with the remainder living on one of the 573 reservations or band areas. Indians live there in order to retain tribal rights, to preserve the traditional occupations of hunting and fishing and the Indian language and lifestyles, or for a variety of other reasons. Traditionally, Indians have had considerable problems with drinking. About 50 percent to 60 percent of their illnesses and deaths are alcohol-related. Their rates of violent death and liver cirrhosis are several times higher than those among non-Indians.

There are some good reservations in Canada where employment levels are high and life is pleasant. However, the majority tend to be collections of a few hundred substandard houses situated in isolated rural or northern areas. Unemployment is usually three or

more times the national average and there are many reservations where there is virtually no steady employment. Changes in recreation patterns have done away with guiding as an occupation. As well, fishing is more difficult as many northern lakes have either no fish or those made uneatable by pollution. Hunting is disappearing as large game becomes less plentiful. Traditional Indian occupations and lifestyles are disappearing. Consequently, most reservations have major problems with unemployment, family breakdown, violence, and alcoholism. Many are too isolated to reach in bad weather, and medical facilities are usually minimal or nonexistent. Given the present social conditions on most Indian reservations, it is not surprising that inhalant abuse is a problem.

Because Indian reservations are often so isolated, people depend upon transport by plane, boat, car, and snowmobile to travel anywhere, including to work. Many people have gasoline drums stored outside their houses; and institutions, such as hospitals, may have dozens. Some drums are full and others are empty or almost empty. It is often difficult to get the last few ounces out of a 50-gallon gasoline drum; so, many supposedly empty drums still provide enough for sniffers to become high. Of course, children and other residents have easy access to these drums and to the many gas tanks for boats, cars, and snowmobiles. Furthermore, naphtha gas is used for cooking, and large quantities of it are also stored inside or outside some houses. It too can be inhaled, but it seems not to be preferred by the substance abusers.

Cases of neuropathy and encephalopathy due to inhalant use have been rarely described in the Canadian medical literature. However, all cases described have been native young people. Boeckx et al. (1977) originally reported three cases of lead encephalopathy from a northern Manitoba community, involving nervous irritability, nausea, tremors, ataxia, and hallucinations. Tenebeim et al. (1984) reported two native Indian children with peripheral neuropathy following the inhalation of naphtha fumes. The abnormalities gradually disappeared when inhalation stopped. In addition, Hunter et al. (1979) described two children presenting with profound retardation, hypotonia, a prominent occiput, poor head growth, and other anomalies. Both were born to gasoline-sniffing parents; hence, the possibility of a "fetal gasoline syndrome" has been suggested. However, heavy alcohol use and genetic factors may also be important.

The first survey of inhalant use on reservations in Canada was made by Lynn (1973), who studied a small Ojibway village in northwestern Ontario. She often observed boys aged 8 to 14 years sniffing gasoline from boat tanks and from empty drums. Of 400 reservation people interviewed, only 7 were nonsniffers, 23 were occasional sniffers, 11 were frequent sniffers, and 359 were former sniffers. Many residents reported that sniffing was done when "home brew" was drunk and that there were potentiating effects. About half of those treated in the clinic had toxic lead levels in the blood. Generally, there was little concern about gasoline sniffing by the young. Many parents were sniffers themselves and "gas sniffing has been accepted in the town by most as quite normal behaviour."

A similar level of sniffing was found by Boeckx et al. (1977) in an Indian community in Manitoba. They estimated that more than 50 percent of children in Shamattawa were sniffing gas (mostly gasoline for cars, but some naphtha). Three cases were described of acute lead poisoning with supporting blood test data. Furthermore, they indicated that other communities in Manitoba also had high levels of sniffing. A later survey by Barnes (1981) corroborated these findings. He found that, of 623 students in Shamattawa, 50 percent were sniffers.

Angle and Eade (1975) studied two native communities in northern Quebec which had both Indian (Cree) and Inuit residents. In one of the communities, Manouane, there was no evidence of gasoline sniffing, although it had been very common a few years earlier. Both observations and blood testing for lead confirmed the negative findings. Probably, sniffing had disappeared because of a well-publicized death in a nearby community.

These findings were contrasted with those for Great Whale River, a somewhat larger community in the same general area. Angle and Eade (1975) conducted interviews, did observations, and administered blood tests for lead levels. They estimated that 63 percent of those aged 6 to 18 had sniffed gasoline or naphtha gas. Most adults under 30 admitted sniffing at some time and some have continued into the present. The youngest people dipped mitts or other clothing in the gas and sniffed throughout the day, even during school hours. The slightly older groups more often sniffed from drums or from plastic bags. Teenagers often had sniffing parties in abandoned houses or during refueling stops on

skiddoo jaunts. Although gasoline seemed to be favoured, nail polish remover was also sniffed.

Some of the reasons for the high level of sniffing in Great Whale River may be the high availability of gasoline and the lack of alcoholic beverages. However, there are other sociocultural reasons which probably contribute to the high level. Real employment is provided only by government agencies and many people are on welfare or in marginal jobs, such as fishing or trapping. Recreation is limited to a few rundown facilities used mainly by the whites. The only activity for the young seems to be "skiddooing" during the winter months and, for a few, motorcycling during the summer. Of course, considerable tension exists between the whites who are more affluent government employees and the natives who are unemployed welfare recipients.

So far in this review, the emphasis has been on Indian communities with inhalant problems. They tend to loom large, probably because the surveys have been done in the problem areas. However, we have no general survey of Indian or Inuit communities across the country or within a single province. It is clear that many Indian communities have no inhalant problems. For example, Angle and Eade (1975) found no inhalant problems in Manouane. Hunter et al. (1979) pointed out that Shamattawa was built in 1949 but, after a few years, the band split up with half moving to York Landing, a similar reservation not far away. Shamattawa has had serious inhalant problems, but York Landing has not. Barnes (1981) surveyed nine different communities in Manitoba--some of them twice in the late 1970s. He found that two communities had high rates of inhalant use (50 percent and 22 percent), three had moderately high rates (11 percent average), and four had low rates (0 to 3 percent). In one community, a survey in the spring gave much higher rates (22 percent) than in the fall of the same year (11 percent).

We have only a few studies attempting to explain why some Indian communities have inhalant problems and others do not. Angle and Eade (1975) speculated about cultural and racial conflicts but gathered no data on them. In some cases, inhalant use appears to be associated with the availability of alcohol, but not always. The only empirical study was conducted by Barnes (1981), who studied nine Indian communities. The lowest rates of inhalant use were found in communities with high levels of social assets and high acculturation to the white man's style of life. The highest rates

were found in communities with less social assets and intermediate acculturation. Inhalant use was associated with "acculturative stress." In communities undergoing rapid change through acculturation, problems were greater. Also, sniffers typically came from homes where a native language was spoken, mothers had a poor education, there was no television, and the father did not work. There were especially low economic and social assets in the homes of gasoline sniffers. It should be noted, however, that one study (Liban and Smart 1982) of a matched group of Indian and non-Indian students not on reservations showed no differences in glue or solvent use. When students were matched for age, sex, grade level, geographic region, and father's occupation, there were no differences in drug use of any type, including alcohol.

A variety of other factors also predicted inhalant use at the individual level. Sniffers tended to be under less parental control and to have more sniffing friends and family members. Sniffers scored lower in their level of school self-acceptance. They also came from homes that were more often broken, that had no running water, where the mother was in poor health, and where there was not enough money for food or clothes.

SOLUTIONS TO INHALANT USE AMONG INDIANS

Most native communities with inhalant abuse problems are ill-equipped to solve them. These communities are small, isolated, and often disorganized. They lack the best hospital, health promotion, and social services and are unlikely to get them because of costs. The worst affected reservations have poor recreational or other social-health programs which could be the basis of effective anti-inhalant programs. Renovating the services in these communities would require a major overhaul and a reorientation of resources, which is unlikely to occur. At present, there is less interest in native affairs, and several provinces are having disputes with the federal government over health care and other social programs for natives. Massive government response to solve inhalant problems seems unlikely in Canada in the near future.

Many Indian communities can do little about inhalants on their own. In several of the communities, gasoline sniffing is accepted and not thought to be a problem. Also, inhalants are often abused by adults as well as young people, and users frequently have parents who are also users. Inhalant abuse is related to poverty

and the level of social assets in a community; hence, prevention may depend on socioeconomic changes beyond the ability of health planners and local officials.

The relationship of acculturation to inhalant use brings other problems. It appears that the most affected communities are those in transition from traditional to more affluent white lifestyles. This transition occurs chiefly because of large-scale petroleum projects, hydroelectric power developments, or other mega projects created by governments or industries. In some cases, the organizers take Indian needs into account in planning these projects, but frequently it is a token recognition. Many argue that acculturation of Indians is the result of inevitable forces which will proceed at their own rate, with little chance for influence.

For all of these reasons, prevention programs for inhalant abuse have been rare in Canada. In some communities, gasoline tanks have been put underground and the caps locked. Barnes (1981) described a pilot project which allowed Indian students to experience more success at school by working outside school and still receiving school credits. Preliminary indications were that this did reduce glue sniffing, but the program ended prematurely. Other types of prevention programs for Canadian Indians have not been described in the scientific literature.

POISON CONTROL INFORMATION ON INHALANTS

Most large hospitals in Canada have a poison control centre; and data from them include poisonings from solvents, glues, and adhesives. Unfortunately, the data are not collected with the interests of drug abuse researchers in mind. There are categories for "glues and adhesives," "hydrocarbons," and "household products," but the latter two are too wide to be useful. Poison control centres do not include data from doctors, most hospitals, or industry. Also, the poisoning data do not specify whether the inhalation was voluntary, recreational, or accidental. This is important in examining the "gasoline" category which has many reported cases (584 in 1984). While they are not taken as national figures, data from these centres may indicate major trends.

The data for poisonings from glue and adhesives are shown in table 4. Rates for total poisonings each year vary between 2.0 and 3.3 per 100,000 population. The rate is fluctuating, but the general trend seems to be upward. Incidentally, these statistics

TABLE 4

Trends in Number and Rate of Poison Control Centre Cases
Due to Glue and Adhesives in Canada

	1978	1979	1980	1981	1982	1983	1984
Total	611	464	773	647	816	814	791
Rate per 100,000	2.6	2.0	3.2	2.7	3.3	3.3	3.1

include telephone calls about poisonings as well as cases actually seen in the hospitals. Among the statistics for glues and adhesives cases, about 62 percent were telephone calls only. It should also be noted that 51 percent of the cases were under 4 years of age and we can assume that many of those were accidental rather that recreational inhalation. There was no fatal outcome involving glues and adhesives in the years 1981 to 1985, although there were more than 400 fatalities each year from other types of drug poisonings.

Poisoning rates from glues and adhesives vary considerably from one province to another. The low of 0.8 cases per 100,000 in Prince Edward Island contrasts to the high of 3.5 cases per 100,000 in British Columbia. The variation may reflect reporting rates, but it is interesting to note that the rate of poisonings is closely associated with the level of alcohol consumption in the province.

Unfortunately, the poison control statistics probably underreport cases among the Indian population of Canada. Poison control centres are usually found in large hospitals and not in the types of hospitals and clinics typically used by Indians. It is impossible to determine the poisoning rate for inhalants for hospitals serving primarily native populations.

INHALANT ABUSERS IN TREATMENT

Relatively few inhalant abusers appear to need treatment for dependence or addiction. National hospital separation rates for drug abusers are available; however, solvent or inhalant abusers are not categorized separately because their numbers are too small. Even if all cases in the catch-all "other" category involved inhalants, that would make only 279 cases or 2.4 percent of the total cases treated.

The Addiction Research Foundation operates one of the largest treatment centres in Canada, with an average of more than 3,000 patients treated each year. Data on the primary drug of abuse for those treated at the Addiction Research Foundation are shown in table 5. It can be seen that, in the mid-1980s, the major drugs of abuse were alcohol, cannabis, cocaine, and narcotics. However, the primary drug problem for about 1 percent of patients was glue and solvents. The proportion has not changed over the past few years and no trend is evident. About 2 percent of patients listed

TABLE 5

Trends in Percentage Reporting Major Substance of Abuse for Patients Admitted to Addiction Research Foundation

	1981[1]	1982	1983	1984	1985	1986[2]
Alcohol	66.2	65.2	61.4	62.2	64.0	61.7
Anti-anxiety drugs	2.8	3.4	4.9	3.6	3.4	2.7
Sedative hypnotics	2.8	2.7	2.2	1.1	1.5	1.3
Narcotics	10.4	10.8	11.2	11.3	8.9	8.6
Stimulants	2.7	2.7	3.3	1.6	2.0	1.7
Cannabis	8.4	8.6	9.1	11.0	10.3	11.5
Cocaine	0.8	1.6	3.3	5.4	7.0	10.0
Hallucinogens	2.8	2.3	2.0	1.7	1.3	0.8
Glue and solvents	1.2	1.0	1.1	1.5	0.8	1.0
Other	1.9	0.7	1.5	0.6	0.8	0.7
Number of patients	1,088	3,240	3,023	1,934	3,706	824

[1]September to December only.
[2]January to March only.

glue and solvents as a secondary or tertiary problem. Thus, it appears that inhalant abusers are not a significant proportion of the treatment population.

CONCLUSION AND SUMMARY

In conclusion, inhalant abuse is not an important problem in Canada as a whole. Inhalants are currently not very popular with students and their use appears to be decreasing. Inhalants do not seem to be an important cause of poisonings nor do they often appear as the primary drug problem for people seeking treatment. However, information on inhalant use among adults is fragmentary.

On the other hand, some inhalant use still exists among students and use tends to be cyclical. Inhalant users tend to be involved in more crime and more polydrug use than nonusers. Also, use of inhalants, such as gasoline, is of epidemic proportions on some Indian reservations. Solutions to the native inhalant problem are not being found and will be very difficult to provide as they will involve major economic and cultural changes.

FOOTNOTE

[1]The views expressed in this document are those of the author and do not necessarily reflect those of the Addiction Research Foundation.

REFERENCES

Adlaf, E.M., and Smart, R.G. Risk-taking and drug use behaviour: An examination. Drug Alcohol Depend 11:287-296, 1983.

Angle, M.K., and Eade, N.R. Gasoline Sniffing and Tetraethyl Lead Poisoning in a Northern Native Community. Ottawa: Health and Welfare Canada, 1975.

Annis, H., and Watson, C. Drug use and school dropout: A longitudinal study. Can Counsellor 9:155-162, 1975.

Barnes, G.E. Solvent abuse: A review. Int J Addict 14:11-26, 1979.

Barnes, G.E. Gasoline sniffing in Northern Canada. Unpublished manuscript. Ottawa: Health and Welfare Canada, 1981.

Boeckx, R.L.; Postle, B.; and Coodin, F.J. Gasoline sniffing and tetraethyl lead poisoning in children. Pediatrics 60:140-145, 1977.

Fejer, D., and Smart, R.G. Drug use, anxiety and psychological problems among adolescents. Ontario Psychol 4(1):10-21, 1972.

Gellman, V. Glue sniffing among Winnipeg school children. Can Med Assoc J 98:1027-1042, 1968.

Hollander, M.J., and Davis, B.L. Trends in Adolescent Alcohol and Drug Use in Vancouver. Vancouver: British Columbia Alcohol and Drug Programs, 1983.

Hunter, A.G.; Thompson, D.; and Evans. J.A. Is there a fetal gasoline syndrome? Teratology 20:75-80, 1979.

Israelstam, S.; Lambert, S.; and Oki, G. Poppers: A new recreational drug craze. Can. Psychiatric Assoc. J 23:493-495, 1978.

Killhorn, J. Chemical Use Among P.E.I. Students: 1983. Charlottetown,: Alcohol and Drug Problems Institute, 1983.

Liban, C.B., and Smart, R.E. Drinking and Drug Use Among Ontario Indian Students. Drug and Alcohol Dependence, 1982, 9, 161-171.

Lynn, H. Gasoline Sniffing Among Indian Children. Unpublished manuscript. Toronto: Wellesley Hospital, 1973.

Smart, R.G. Forbidden Highs: The Nature, Treatment and Prevention of Illicit Drug Abuse. Toronto: Addiction Research Foundation, 1983.

Smart, R.G. Solvent abuse in North America: Aspects of Epidemiology, Prevention, and Treatment. J Psychoactive Drugs 18(2):87-96, 1986.

Smart, R.G.; Adlaf, E.M.; and Goodstadt, M.S. Alcohol and Other Drug Use Among Ontario Students in 1985 and Trends Since 1977. Unpublished manuscipt. Toronto: Addiction Research Foundation, 1985.

Tenenbeim, M.; DeGroat, W.; and Rajani, K.R. Peripheral Neuropathy Following Intentional Inhalation of Naphtha Fumes. Can. Med. Assoc. J 131:1077-1079, 1984.

AUTHORS

Reginald G. Smart, Ph.D.
Director of Prevention Studies
Addiction Research Foundation
33 Russell Street
Toronto, Ontario M5S 2S1, Canada

Epidemiology of Solvent/Inhalant Abuse in Mexico

Elena Medina-Mora, Ph.D., and Arturo Ortiz, Ph.D.

INTRODUCTION

Abuse of substances with psychotropic effects is present in most countries of the world, with variations in the type of substances abused, the pattern of use, and the characteristics of users. In Mexico, the abuse of solvents--initially limited to minority groups--has extended and is now observed in all sectors as becoming the drug of choice, even among high school students who had not been considered previously as a group at high risk. In this paper, we review the available literature on solvent abuse for the country.

The paper is divided into the following sections: Sources of Information; Prevalence of Drug Use and Trends; Groups of Population Affected; and Patterns of Use.

SOURCES OF INFORMATION

By the end of the 1960s and the beginning of the 1970s, it had become apparent through different indicators that drug use was no longer restricted to minority groups (i.e., cannabis use among soldiers) and that it was spreading to other groups, especially among youngsters. It is in this time that the first Mexican drug use studies were carried out. The first surveys were conducted among the school population. The results from these surveys are difficult to interpret because the questionnaires employed vary; they either included only small sectors or were not conducted among representative samples. In spite of these differences, the rates of illegal drugs ever used reported did not show strong

variations (13 percent to 20 percent); also, marijuana was the drug most frequently reported (see table 1).

In 1972, the Centro Mexicano de Estudios en Farmacodependencia CEMEF (Mexican Center for Studies in Drug Dependence) was created (actually, Instituto Mexicano de Psiquiatria, IMP). The scope of research was widened, and the methods and techniques were tested and standardized. Household surveys among population 14 years of age and over were conducted in seven cities of the Mexican Republic (see tables 2 to 5). Studies among student populations include two national surveys of students between 14 and 18 years of age (Castro et al. 1978, 1986); students were also studied in the Federal District in 1978 (Castro and Valencia 1980) and in 1980 (Castro and Maya 1982a). In this last year, a survey was conducted among university students (Castro et al. 1986). In 1981, the Centros de Integracion Juvenil, an organization for the treatment and prevention of drug use, conducted a school survey in 15 cities of the Mexican Republic. The same instrument used in the studies mentioned previously was answered by male and female students, 12 years of age and over, who had completed 7 to 16 years of school (Centros de Integracion Juvenil 1984) (see figure 1).

Also, from 1972 to 1980, Cabildo (1980) conducted a trend study among five samples of school population from 16 to 18 years of age who lived in the northern sector of Mexico City. Other small studies were conducted after 1980 (see table 6).

Other studies have been conducted among the adult imprisoned populations (Centros de Integracion Juvenil 1981; Mier y Teran et al. 1974; Ruiz-Harrel 1974; Safa-Barraza et al. 1973; Schnaas 1976; Suarez 1979) (see table 7; figure 2), and among minor offenders (Medina-Mora et al. 1977; Ruiz de Chavez 1978; Secretaria de Gobernacion 1979) (see table 8).

Unfortunately, these studies, except the school survey mentioned above, have been conducted at only one point of time. Thus, trends are difficult to estimate.

A few epidemiological studies with anthropological emphasis have also been conducted in Mexico. They include studies among solvent users in target areas (Garza et al. 1978; Leal et al. 1977; Medina-Mora et al. 1982), naturalistic and case-finding studies among polydrug users (Chavez et al. 1974; Medina-Mora et al.

TABLE 1

Percentage of Drug Use among Students in Mexico

Author	Type of school and area covered	Age group (years)	Sample size	Rate of ever use
Carranza 1972	Secondary School, Mexico City	13-20	7,800	15.0% illegal drugs (marijuana more frequently)
Cabildo 1974	Preparatory and equivalent sector of Mexico City	16-18	497	17.0% Illegal drugs (marijuana more frequently)
Wellish and Hay 1974	Secondary School Monterrey, N.L.	15-18	229	12.9% Marijuana 4.7% Inhalants 0.9% Opiates or cocaine
Lafarga 1972	Private University, Mexico City	18-23	642	20.0% Marijuana 0.7% Hallucinogens
de la Fuente and Campillo 1972	National University, Mexico City	16-25	233	10.4% Marijuana 10.7% Inhalants 1.2% Hallucinogens

FIGURE 1

Inhalant Use Among High School Students

Region	n*	n**
	1976	1981
1	973	1088
2	1044	246
3	1230	---
4	525	---
5	736	474
6	587	365
7	304	529
8	2317	5558
9	404	523
10	363	---
11	622	474
12	407	1039
13	388	---

* CEMEF: Chao and Castro 1976. (Castro et al. 1978).
** Centros de Integración Juvenil 1984.

TABLE 2

Percentage Reporting Ever Use of Drugs in Seven Cities of the Mexican Republic
(Household Survey Population, Age 14 years and Older)

Drug	Distrito Federal[1] 1974 N=4,982,000 n=2,733	San Luis Potosi[2] 1975 N=215,000 n=624	Puebla[2] 1976 N=390,000 n=666	La Paz[3] 1974 n=444
Marijuana	1.3	2.1	0.3	4.9
Solvent/Inhalants	0.4	0.5	0.01	0.7
Hallucinogens	0.9	0.9	---	1.1
Heroin	0.1	---	---	0.4
Cocaine	---	---	0.2	0.7
Barbiturates*	4.2	0.8	0.8	4.7
Amphetamines*	2.1	1.0	2.2	2.0

Drug	Mexicali[4] 1978 N=263,000 n=684	Monterrey[5] 1975 N=965,000 n=800	Morelia[6] 1985 N=216,000 n=885
Marijuana	6.7	0.2	2.0
Solvent/Inhalants	0.7	0.2	0.08
Hallucinogens	0.2	---	0.22
Heroin	0.02	0.2	---
Cocaine	1.6	---	0.05
Barbiturates*	2.2	0.8	3.0
Amphetamines*	4.1	0.3	1.3

*Use without prescription

[1]Medina-Mora, 1978
[2]Parra et al., 1979
[3]Medina-Mora and Terroba, 1978
[4]Ruiz-Harrel, 1974
[5]Natera and Terroba, 1979
[6]Medina-Mora, 1986

FIGURE 2

Patients Attended in Specialized Treatment Facilities

1980), and case studies (Clarac et al. 1975; Solorzano 1979). (See tables 9 to 11.)

Most of the studies have been oriented toward the detection and study of drug users; only three included a nonusers comparison group (Caudillo 1982; Chavez et al. 1974; Medina-Mora et al. 1982) and only one provided estimations of prevalence (Medina-Mora et al. 1982). Also, most of the studies have been conducted during only one period of time; two have studied the same area in different periods, 1974 (Chavez et al. 1974) and 1978 (Medina-Mora et al. 1980); another is a 2-year study of the same area and group of users (Leal et al. 1977); and, in a more recent study, a group of users and a peer group that was not using drugs were followed for a period of 1 year. The main objective of this project was to evaluate long-term cognitive effects of chronic use and to gain some knowledge of the natural history of solvent abuse (Ortiz and Caudillo 1985).

Other sources of information are social studies of gangs and other youth groups among whom drug use is a common practice (Villaforte 1985). Finally, statistics from 32 specialized treatment facilities for drug users are also available (Centros de Integracion Juvenil 1983).

PREVALENCE OF DRUG USE AND TRENDS

From the sources consulted, it became apparent that the substances most commonly abused in the country are marijuana followed by inhalants and amphetamines. Since 1970, the drugs more commonly used by the persons attended in the specialized treatment facilities in the Mexican Republic are marijuana followed by solvents. The proportion of patients that report the use of the different drugs vary according to the region of the country. Figure 1 shows the proportion of users of each drug, which was obtained from data on the total number of patients attended in 1983. The use of narcotics (opium, heroin, morphine, and others) varied between 10 percent in the noroccidental area and 1.3 percent in the central region. Narcotic use was not observed among the patients attended in the treatment facilities in the south of the country. Patients' marijuana use varied between 41 percent in the south and 30 percent in the Federal District. Inhalant use varied between 27 percent in the central area of the country to 13 percent in the noroccidental area (Centros de Integracion Juvenil 1983).

TABLE 3

Patterns of Drug Use in Different Cities of the Mexican Republic
Household Surveys, Population 14 Years and Over

	Distrito Federal[1] 1974 N=4,982,000 n=2,733		La Paz[1] 1974 -- n=444		San Luis Potosi[2] 1975 N=215,000 n=624	
Drugs	Ever use	Last 30 days	Ever use	Last 30 days	Ever use	Last 30 days
Marijuana	1.3%	0.3%	4.9%	2.9%	2.1%	2.0%
Solvents	0.4%	0.12%	0.7%	0.7%	0.5%	--
Tranquilizers*	0.5%	0.8%	5.0%	5.0%	6.7%	3.4%
Barbiturates*	1.4%	1.4%	1.1%	1.1%	0.7%	0.3%
Amphetamines*	2.3%	0.8%**	0.7%	0.7%	0.2%	0.2%

Drugs	Puebla[2] 1976 N=390,000 n=666		Mexicali[3] 1978 N=263,000 n=684		Distrito Federal[4] 1978 -- n=4,059	
	Ever use	Last 30 days	Ever use	Last 30 days	Ever use	Last 30 days
Marijuana	0.3%	0.3%	8.6%	3.8%	4.0%	1.1%
Solvents	0.01%	0.01%	0.7%	0.06%	5.6%	1.5%
Tranquilizers*	2.2%	1.0%	0.7%	0.3%	3.1%	0.83%
Barbiturates*	0.5%	0.5%	0.5%	0.02%	1.3%	0.42%
Amphetamines*	0.03%	0.03%	1.2%	0.6%	2.7%	0.61%

* Use without prescription.
** Includes the use of amphetamines and other stimulants.

1 Medina-Mora et al. 1978
2 de la Parra et al. 1979
3 Terroba and Medina-Mora 1979
4 Castro and Valencia 1980

TABLE 4

Percentage Reporting Drug Use by Sex in Six Cities of the Mexican Republic
(Household Survey Population, Age 14 years and Older)

	Distrito Federal[1] 1974 N=4,982,000 n=2,733		La Paz[1] 1974 -- n=444		San Luis Potosi[2] 1975 N=215,000 n=624		Puebla[2] 1976 N=390,000 n=666	
	M N=2,320,000	F N=2,678,000	M n=222	F n=221	M N=84	F N=131,000	M N=148,000	F N=242,000
Marijuana*	2.4	0.3	9.0	0.9	3.3	1.3	0.7	---
Solvents*	0.7	0.1	1.4	---	1.4	---	0.03	---
Barbiturates**	0.6	2.4	1.8	0.9	5.3	1.5	0.4	0.8
Tranquilizers**	3.0	5.2	6.3	9.9	6.4	10.5	3.0	4.1
Narcotic Analgesics*	4.1	5.6	9.8	8.1	5.7	1.2	2.0	5.0
Amphetamines**	0.2	0.4	0.5	1.8	0.8	---	0.1	1.5

	Mexicali[3] 1978 N=263,000 n=684		Monterrey[4] 1975 N=900,000 n=800	
	M N=137,000	F N=125,000	M N=400,100	F N=500,000
Marijuana*	11.4	1.5	0.4**	---
Solvents*	1.4	---	0.25**	0.14**
Barbiturates**	0.8	0.3	0.42	1.16
Tranquilizers**	3.2	3.5	2.8	3.5
Narcotic Analgesics*	0.05	1.8	0.26	0.14
Amphetamines**	0.02	2.4	0.10	0.50

*Percentage of ever use.

** Percentage of use in the last month or at least daily during 1 week in the last 6 months with or without prescription.

Source:

[1]Medina-Mora et al. 1978
[2]Parra et al. 1979
[3]Terroba and Medina-Mora 1979
[4]Natera and Terroba 1979

TABLE 5

Percentage Reporting Drug Use By Age Group in Five Cities of the Mexican Republic (Household Survey Population, Age 14 years and Older)

	Distrito Federal[1]			La Paz[1]			San Luis Potosi[2]		
	14-17 yrs N=737,000	18-24 yrs N=1,140,000	25+ yrs N=3,055,000	14-17 yrs N=84	18-24 yrs N=142	25+ yrs N=217	14-17 yrs N=39,616	18-24 yrs N=55,826	25+ yrs N=119,484
Marijuana*	0.6	3.8	0.5	3.0	7.0	--	6.3	2.5	0.3
Solvents*	1.0	0.8	0.3	--	2.1	--	--	2.1	--
Barbiturates**	2.1	0.6	1.9	1.1	2.0	0.9	0.9	0.6	0.1
Tranquilizers**	0.3	2.7	5.9	4.7	9.7	8.3	0.4	3.3	14.3
Narcotic Analgesics**	5.6	5.0	4.7	1.2	10.5	11.1	0.4	4.2	3.3
Amphetamines**	0.4	0.7	0.7	1.1	0.7	1.4	--	--	--

	Puebla[2]			Mexicali[3]		
	14-17 yrs N=62,138	18-24 yrs N=112,054	25+ yrs N=215,851	14-17 yrs N=49,977	18-24 yrs N=68,228	25+ yrs N=144,227
Marijuana*	--	0.8	0.1	3.0	12.4	5.2
Solvents*	0.1	--	--	0.05	2.8	---
Barbiturates**	1.5	0.1	0.7	--	0.09	1.0
Tranquilizers**	4.7	0.3	5.1	1.7	3.2	4.0
Narcotic Analgesics**	7.1	4.1	2.8	1.4	1.5	0.5
Amphetamines**	--	1.2	1.1	--	2.9	0.4

*Percent of ever use
**Percentages of use in the last month or at least daily during 1 week in the last 6 months with or without prescription

Source:

[1]Medina-Mora et al. 1978
[2]Parra et al. 1979
[3]Terroba and Medina-Mora 1979

TABLE 6

Studies of Drug Use Among School Populations in the Mexican Republic

Author	Type of school and area covered	Age group (years)	Sample size	Rate of drug use
Limon and Torres 1982	State University, Mexico City	17-30	104	Illegal drugs (marijuana more frequently 15.0%
Mata 1983	Secondary and preparatory school in one area to the south of Mexico City (6 to 12 years completed).	12-18	627	Use of Hallucinogens (higher than the average observed in Mexico City) 2.1%
Cabildo 1980	One area to the north of Mexico City (9 to 12 years of school completed).	15-18	1970 = 455 1971 = 442 1974 = 497 1976 = 625 1980 = 494	1970 1971 1974 1976 1980 Experimenters 11.6 12.4 17.5 20.8 12.3 Frequent users 1.9 2.7 2.4 3.0 1.8 Marijuana first drug used, followed by inhalants, sedatives, and amphetamines.

TABLE 7

Percentages of Drug Use Among Imprisoned Population in the Mexican Republic

Author	Type of study	Population	Drug use		
Mier Y Teran et al. 1974	Case study of drug users	Females age over 18 years n = 24		Ever use	Daily use
			Marijuana	88%	50%
			Inhalants	25%	8%
			Hallucinogens	17%	13%
			Opiate derivatives	29%	13%
			Cocaine	33%	4%
Ruiz Harrel 1974	Case study comparison between users and nonusers	Males age over 18 years	Use at least once in last 3 months		
			Marijuana	96.42%	
			Barbiturates	35.71%	
			Heroin	17.85%	
			Hallucinogens	16.65%	
			Inhalants	8.33%	
			Cocaine	8.33%	
Schnaas 1976	Case study of drug users	Males age over 18 years n = 24		Ever use	Daily use
			Marijuana	93%	60%
			Inhalants	50%	15%
			Hallucinogens	48%	15%
			Opiate derivatives	55%	57%
			Cocaine	14%	--
Safa-Barraza et al. 1973	Epidemiological study--Sample of population of four rehabilitation centers within the Federal District	Males age over 18 years N = 4,974 n = 390		Ever use	
			Marijuana	19%	
			Solvents	3%	
			Hallucinogens	4%	
			Opiate derivatives	5%	
Suarez 1979	Epidemiological study--Sample of population of a state prison	Males age over 18 years N = 454 n = 100		Ever use	
			Marijuana	16%	
			Inhalants	1%	
			Marijuana and Inhalants	3%	
			Marijuana and Inhalants Use without prescription	5%	
			Hallucinogens	5%	
			Marijuana and Hallucinogens	1%	

TABLE 8

Studies of Drug Use Among Institutionalized Minor Offenders in the Mexican Republic

Author	Type of study	Population	Drug use
Medina-Mora et al. 1977	Analysis of files of minors institutionalized between 1971 and 1972, D.F.	Minors under 18 years of age	1971 1972 Marijuana 5.4% 8.8% Inhalants 9.2% 12.4%
Ruiz de Chavez 1978	Analysis of files of minors institutionalized in 1974, D.F.	1,066 males and 161 females under 18 years of age	8% males and 4% females were institutionalized due to intoxication of the users: 76% and 89%, respectively, were inhalant users; only 16% and 11% used marijuana; and 1% of the males reported use of LSD.
Secretaria de Gobernacion 1979	Analysis of files of minors institutionalized between 1974 and 1978, D.F.	23,568 minors from 7 to 17 years of age	10.11% males and 4.57% females were institutionalized due to intoxication.

Intoxication due to inhalation of volatile solvents is the second cause of intoxication reported in the toxicology reporting system of the Federal District; the first cause is due to alcohol. In addition, 3.4 percent of the cases were due to solvent/inhalants, 1.6 percent due to the ingestion of barbiturates, 0.27 percent due to mescaline, and 0.27 percent due to cannabis.

Rates of drug use among the general population of the seven cities studied are shown in table 2. Though comparisons are difficult to make because of the difference in time when the various studies were conducted, some general conclusions can be derived. Among the general population, solvents/inhalants are not the drugs of choice; marijuana, amphetamines, and barbiturates are more commonly reported. Rates of drug use are higher in the cities located in the noroccidental area of the country. In general, drugs of medical use are more commonly reported by females, while the use of illegal drugs and of inhalants is more common among males. The group more affected is between 18 and 24 years of age; only in the Federal District did the population over this age report inhalant use (Medina-Mora 1978; Medina-Mora et al. 1978, 1986; Natera et al. 1979; de la Parra et al. 1979a, 1979b; Ruiz-Harrel 1974). Higher rates of drug use are observed among nonstudents (Smart et al. 1981).

Inhalant use occupies between the third and fifth place of preference of the imprisoned population (table 7). In 1981, 2.8 percent of 8,431 persons studied in institutions of social readaptation reported its use, occupying the third place of preference. Important variations were observed in the regions studied, the rates varied between 0.4 percent and 18 percent, with the northern region being the least affected and the central region having the highest rates (Centros de Integracion Juvenil 1981).

Trends in the use of drugs in student population can be determined through the comparison of figures obtained in surveys of representative samples conducted in the Federal District in 1976, 1978, and 1980. From 1976 to 1978, it was found that the experimental use of cannabis and inhalants increased significantly. Unimportant differences were observed in the trends of regular or heavy use. The rate of ever use was 13 percent in 1978 and 12.3 percent in 1980 (Castro and Valencia 1980).

In 1978, inhalants occupied the first place of preference among students, whereas in 1976, cannabis was the drug more commonly

TABLE 9

Studies With an Anthropological Emphasis of Drug Use in the Mexican Republic

Author	Area	Type of Study	Population	Drug Use
Chavez et al. 1974	Suburban community, low S.E. level	Comparison between matched groups of users and nonusers	18-23 years of age n = 17 users	Drug more frequently used: Marijuana 59% Inhalants 59% Barbiturates 12% Amphetamines 12%
Clarac 1975	Metropolitan area of Mexico City	Case study	16-20 years of age n = 70 users	Marijuana 96% Inhalants 57% LSD 31% Barbiturates 19% Amphetamines 19%
Leal et al. 1977	Target area within Mexico City	Follow-up study of drug users	Minors under 13 n = 24 (follow-up)	Inhalation at least 4 days per week.
			Adolescents 13-16 years of age	Daily use of solvents.
			Young adults 17-23 years of age (n = 144; N = 310)	Combination of alcohol and solvents and, in some cases, use of marijuana.

Author	Area	Type of Study	Population	Drug Use
Garza et al. 1978	Two suburban communities within Monterrey, N.L.	Naturalistic study	28 families 32 users between 10 and 22 years of age or over 62% under 15 years of age	Inhalation at least once a week.
Medina-Mora et al. 1980	Suburban community, low S.E. level	Intensive case-finding	N = 123 users detected n = 62 cases studied 14-35 years of age	Marijuana 95% Inhalants 31% Amphetamines 18% Hallucinogens 13%
Medina-Mora et al. 1982	Target area within Mexico City	Sample of minors that make their living within the selected area	N = 329 n = 66 6-18 years of age	Ever use / Daily use Solvents 27% 22.0% Marijuana 10% 1.5%

TABLE 10

Case-Finding of Epidemiological Studies With an Anthropological Emphasis of Drug Use in the Mexican Republic

Author	Area	Type of study	Population	Drug use
Solorzano 1979	Mexico City	Case study	1,000 working non-salaried children from 6 to 14 years of age 77% attended school 96% lived with family	Experimenters or occasional users. 6.4% Frequent use. 1.9% Drug of choice: marijuana followed by inhalants
Barrera et al. 1982	City of Coatzacoalcos within the state of Veracruz	Combination of household and intensive case-finding among workers	Not specified	Percentages of ever use Marijuana 6% Tranquilizers 4% Inhalants 1%

TABLE 11

Percentages of Ever Use and Daily Use of Inhalants Among Institutionalized Children and Adolescents in the Mexican Republic

Author	Type of study	Population	Inhalant use	
			Ever Use	Daily Use
Caudillo 1982	Comparison of users and nonusers	Minors included in protection houses with no antecedents of institutionalization* 4-16 years of age N = 482 n = 8	37%	12%
Caudillo 1982	Comparison of users and nonusers	Minors included in protection houses with antecedents of institutionalization 4-17 years of age N = 329 n = 69	75%	55%

* Refers to antecedents of institutionalization in the Tutelar Council due to delinquent behavior, including intoxication, or, in these types of houses, due to lack of family or for working or sleeping in the streets.

used. From 1978 to 1980, the use of drugs did not increase or decrease significantly. Nevertheless, prevalence rates (4 percent average) for inhalant use by students attending schools in low socioeconomic level areas in 1978 were the same as those for students attending schools in all socioeconomic zones in 1980 (Castro and Maya 1982a).

Trends of drug use are also observed comparing the results from the national surveys conducted in 1976 (Castro et al. 1978) and in 1986 (Castro et al. 1986), that reported figures for 13 regions of the Republic, and from the study conducted in 15 cities in 1981 (Centros de Integracion Juvenil 1984) among students.

In 1986, the rate of ever use was similar to the one observed in the Federal District in 1976 and 1978. Unfortunately, we do not have a global figure of drug use by students for 1976. In 1986, the ever use of at least one substance was 11.9 percent, which was slightly lower than the rates observed in the capital city in 1978 and in 1980--13 percent and 12.3 percent, respectively.

At the national level, an increase was observed for the use of inhalants, marijuana, and amphetamines. The rates of ever use of inhalants were 0.85 percent in 1976 and 4.4 percent in 1986 (Castro et al. 1986).

Excluding tobacco and alcohol, rates of use in the last 30 days were very small, lower than 1 percent for all drugs. The highest rates were observed for amphetamines (1.1 percent), cocaine (0.9 percent), inhalants (0.9 percent), and marijuana (0.7 percent); rates of daily use varied between 0.3 percent and 0.1 percent (Castro et al. 1986).

In 1981, the rate of ever use of all drugs was 15 percent. This was slightly higher than the rates previously mentioned, probably due to the fact that this study was only conducted among the student population of 15 cities and that the rate includes university students.

The rates so far presented that are quite low may be misleading as the highest risk groups are not included in school and household surveys. Rate of drug use among nonstudents and minors who may not have been reached through household surveys may be higher. Results from some studies that have included this type of population are presented in the following section.

GROUPS OF POPULATION AFFECTED

Solvent abuse is observed among groups with different sociodemographic characteristics, lifestyles, and degree of involvement with drug use.

One group may be defined as polydrug users whose drugs of choice are marijuana and amphetamines and, to a lesser degree, solvents. This type of user seems to be rather stable, living in suburban communities of low socioeconomic levels. In spite of the fact that most of them are out of school and have unstable occupations, some attend school; the types of work they perform in most cases are in unskilled job areas (Clarac et al. 1975; Chavez et al. 1974; Medina-Mora et al. 1980).

Solvent abusers seem to be more unstable and deteriorated in cognitive and motor skills.

Solvent use is frequently observed among minors who work on the streets. This group has been a focus in the surveys undertaken in Mexico, four of them in the Federal District and one in the city of Monterrey, Nuevo Leon. These studies vary in their results.

Leal in 1977 reported a high frequency of regular drug use among minors between 7 and 12 years of age who lived in the center of the capital city. Solorzano in 1980, in a case study of 1,000 minors from 6 to 14 years of age who earned money through different types of activities (such as carwashing or helping in supermarkets), reported a low prevalence rate--6.4 percent for ever use and 1.9 percent for frequent use (Solorzano 1979). Both groups differed in many aspects, among them the place of residence: the first study was conducted in a high-risk zone, whereas the second study included minors from all the areas of the capital city.

Other important differences were in school attendance and the contact with the family of origin. The minors from the first study had dropped out of school or had never started formal studies and contact with family was nonexistent, whereas 77 percent of the minors from the second study were attending school and 96 percent were living with the family.

In 1981, a case study was undertaken in two welfare social institutions, one of which housed minors who had recently started to work on the streets and with no antecedents of institutionalization. The second housed minors with antecedents of having been institutionalized in one of the houses of protection. These groups differed in school attendence: 83 percent of the minors studied in the first institution were attending school; this was observed in only 1.4 percent of the second group. Contact with the family also differed: 56 percent of the first group and 20 percent of the second group lived with their families. The age range of the minors from the first institution varied between 8 and 14 years (average = 11.6), and the second one, from 8 to 16 years (average = 12.1). The average number of years of formal education were 2.8 and 1.5 years, respectively; only males were studied.

Prevalence of drug use was also different: 37 percent of the minors without antecedents of institutionalization and 75 percent of the ones with antecedents reported use of drugs at least once in the lives; 12 percent and 55 percent, respectively, reported frequent use (Caudillo 1982).

In 1982, a study was undertaken with minors who work on the streets (Medina-Mora et al. 1982) with the aim of (a) developing a methodology for selecting probabilistic samples and obtaining reliable information, and (b) estimating prevalence of use among a group of minors who work on the streets. In order to conduct this study, an area of great activity was chosen: one with different types of commerce, the presence of parks, and the bus and underground terminals which provided jobs and shelter for the minors. All minor children and adolescents that worked in the area were included; minors that only used the area as access to other places were excluded from the study. The sample design was stratified; the variable for stratification was the different characteristics of the zones within the target area.

In order to determine the size of the universe and to evaluate the possibility of elaborating a reliable sampling frame, two observers undertook an independent register of the cases observed in each zone. One of the observers selected at random the subjects for interviewing. The register of both observers varied by 4 percent (12 persons). The estimated size of the universe was 329 minors; the nonresponse rate was 9 percent. The confidence limits of the estimation of prevalence was plus/minus 7 percent.

Ninety-five percent of the subjects studied were males, with an age range of 6 to 18 years (average of 12.8 years); 67 percent were not attending school at the time of the study; the average years of school completed was 4.2 years, when an average of 6 was expected according to their age; and 47 percent slept on the streets. Excluding alcohol and tobacco, the drugs most commonly used were solvents, for which 27 percent reported ever use and 22 percent daily use; 9 percent reported inhalation four or more times a day. The second drug of choice was marijuana; 10.3 percent reported ever use and 1.5 percent, daily use. One subject reported use of medical drugs; use of other drugs was not reported.

The rate of ever use of alcohol was very similar to the one reported for inhalants, 28 percent; but daily use was 10 times lower, 2 percent. The average age for first use was 8.4 years. The time of drug use varied between 0 and 6 years, with an average of 4.5 years.

Seven variables predicted significant drug use ($R^2 = .42$). These variable were not attending school, a minor age for starting to work on the streets ($X = 8.7$ and $X = 10.2$, respectively), a low income, and personal use of the money earned in comparison to family use. A bigger proportion of the users were born outside the capital city and, more frequently, the brothers and friends used drugs.

This study was replicated afterwards in the city of Monterrey, among minors who worked on the streets (F. de la Garza, unpublished report). In this study, it was found that drug use was not a problem among this group, as opposed to what was observed in the capital city; inhalant users were found in the marginal communities.

Solvent abusers tend to modify their drug-taking behavior across time. The followup study conducted among users and nonusers (Ortiz and Caudillo 1985) showed that, after 12 months, 58 percent of users were abstinent and 42 percent that were initially nonusers were using drugs.

In general, antisocial behavior has been associated with the use of drugs. A significantly higher proportion of users report involvement in such activities as stealing or violent behavior among others. This is observed even among young persons not

highly involved in the use of drugs, such as students (Castro et al. 1986). Recently, in Mexico City, new types of gangs have been observed.

This phenomenon has arisen from the social, political, and economic crisis that results in lack of opportunities and alternatives for the growing, each time more numerous, youth population (Villaforte 1985).
These groups, called "bandas," are formed by 150 to 200 youngsters between 12 and 20 years of age. Quite often they steal and become involved in crime, such as rape, assaults, and even homicide. The use of solvents, marijuana, and alcohol is common among these groups.

PATTERNS OF USE

Inhalation is a practice usually performed in a group. The type of substances and the patterns of use are related to the type of population and circumstances.

Among students or nonstudents that live with the family, inhalant use is an experimental practice. Among minors who work or live on the streets, inhalation is part of their everyday lives. Among this last group, the patterns of use also vary. In places where police are not around, the minors use plastic bags in which an inhalant, usually glue, has been introduced; the plastic bag is located in either the nose or the mouth or both. This pattern of use usually leaves spots of glue in the mouth and on the hands. When the police are around, the minors develop skills for inhaling without being noticed--for instance, wetting a cloth with thinner or wetting the sleeve of the sweater with solvent from a container (bottle) usually tied to the waist inside the clothing (Leal et al. 1977). Other groups prefer to wet a cloth with paint and cover it with paper; they are called flutes (Garza et al. 1978). University students report the use of sprays, ink, and even alcohol (Castro and Maya 1982).

CONCLUSIONS

Though there are no national estimates of the extent of the problem in the country, results from the surveys that have been conducted indicate that solvent abuse is the main drug problem in Mexico. Abuse of these substances is associated with other social and economic problems; association with antisocial behavior is

important and most probably the trend toward increase will continue.

Solvent abuse affects mainly children and adolescents; and, at the same time, very few solvent abusers demand treatment. This indicates the need to either develop services adapted to the needs of this group or to widen the scope of the existing facilities in order to provide attention to this high-risk group. Also, due to the specific characteristics of this group, the prevention efforts should be developed specifically toward the management of this type of drug problem. It is obvious that more research is required specifically among gangs and the population that is not studied in school and household surveys.

REFERENCES

Barrera-Caraza, E.; Cieza, F.C.; Contreras, H.A.; Espinosa, A.P.; Rodriguez, H.; Salas, M.W.; and Yebra, P. Farmacodependencia y alcoholismo en los jovenes veracruzanos: Estudiantes, trabajadores y marginales. Un estudio preliminar. Rev Estudios Sobre Juventud (Mex) 2(3):37-59, 1982.

Cabildo, H.M. Encuestas para detectar trastornos psiquicos. Higiene Salud Ment 18:115, 1974.

Cabildo, H.M. Investigacion sobre el uso de sustancias intoxicantes. Quinta muestra. Salud Publica Mex V XXII(5):467-480, 1980.

Carranza-Acevedo, J. Farmacodependencia en estudiantes de ensenanza media en el Distrito Federal. Manuscrito presentado al Consejo Nacional de Problemas en Farmacodependencia, SSA. Publica Tecnica 4:1-16, 1972.

Castro, M.E., and Maya, M.A. Estudio sobre el uso de drogas entre estudiantes universitarios. Instituto Mexicano de Psiquiatria, Publicacion Interna (Unpublished Report), Mexico, 1982b.

Castro, M.E., and Valencia, M. Consumo de drogas en Mexico. Patrones de uso en la poblacion escolar. Salud Publica Mex XX(5):585-590, 1978.

Castro, M.E., and Valencia, M. Drug consumption among the student population of Mexico City and its metropolitan area: Subgroups affected and the distribution of users. Bull Narc XXXII(4):30-37, 1980.

Castro, M.E.; Chao, Z.; and Smart, R. The distribution of drug use in Mexico: Data from a national study. Bull Narc XXX(2):49-54, 1978.

Castro, M.E.; Rojas, E.; Garcia, Z.G.; and de la Serna, J. Epidemiologia del uso de drogas en la poblacion estudiantil. Tendencias en los ultimos 10 anos. Rev Salud Ment 1986.

Caudillo, C. Estudio Descriptivo y Comparativo de Menores Captados por dos Instituciones que Realizan Actividades Lucrativas en la via Publica y Son Usuarios de Inhalantes. Trabajo de opcion terminal, Universidad Autonoma Metropolitana-Iztapalapa, Mexico, 1982.

Centros de Integracion Juvenil. Investigacion Epidemiologica en Centros de Readaptacion Social. Reporte Interno (Internal Report), Mexico, 1981.

Centros de Integracion Juvenil. Una Respuesta Integral al Fenomeno de la Farmacodependencia. Mexico, 1982.

Centros de Integracion Juvenil. Anuario Estadistico. Mexico, 1983.

Centros de Integracion Juvenil. Investigacion Epidemiologica en Escuelas. Reporte Interno (Internal Report), Mexico, 1984.

Chavez, H.M.I.; de Solis, A.A.; and Pacheco, G. Estudio Naturalistico del Fenomeno de la Farmacodependencia en una Colonia Suburbana del Distrito Federal. Reporte Interno (Internal Report), CEMEF, Mexico, 1974.

Clarac, P., and Rosales, L. Investigacion social sobre el adolescente farmacodependiente en el Distrito Federal y zonas colindantes. Cuadernos Cientificos CEMEF (Mex) 5:135-186, 1975.

Fuente, R., de la, and Campillo-Serrano, C. Trastornos psiquiatricos relacionados con el consumo de drogas. Gaceta Med Mex 103(5):384-392, 1972.

Garza, G.F., de la; Mendiola, H.I.; and Rabago, S. Psychological, familial and social study of 32 patients using inhalants. In: Sharp, C.W., and Carroll, L.T., eds. Voluntary Inhalation of Industrial Solvents. National Institute on Drug Abuse. DHEW Pub. No. (ADM) 79-779. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1978. pp. 75-89.

Lafarga, J. Encuesta sobre las actitudes del estudiante en una universidad privada de Mexico, ante el uso de drogas. Comunidad (Mex) VI(35), 1972.

Leal, H.; Mejia, L.; Gomez, L.; and de Salinas, V.O. Estudio naturalistico sobre el fenomeno del consumo de inhalantes en ninos de la ciudad de Mexico. In: Contreras, C., ed. Inhalacion Voluntaria de Disolventes Industriales. Trillas, Mexico, 1977. pp. 442-459.

Limon, N., and Torres, O. Uso y abuso de sustancias, farmacos y drogas en una universidad estatal. Rev Estudios sobre Juventud 2(3):19-36, 1982.

Mata, M.A. Estudio sobre el uso de drogas en una muestra de estudiantes de la Delegacion de Cuajimalpa. Resultados Preliminares (Research in Progress). Division de Investigaciones Epidemiologicas y Sociales, Instituto Mexicano de Psiquiatria.

Medina-Mora, M.E. Prevalencia del consumo de drogas en algunas ciudades de la Republica Mexicana. Encuestas de Hogares. Ensenanza Invest Psicologia IV(7):111-125, 1978.

Medina-Mora, M.E.; Schnaas, A.L.; Terroba, G.; Isoard, Y.; and Suarez, C. Epidemiologia del consumo de sustancias inhalantes en Mexico. In: Contreras, C., ed. Inhalacion Deliberada de Disolventes Industriales. Trillas, 1977. pp. 352-362.

Medina-Mora, M.E.; Terroba, G.; de la Parra, A.; and de la Parra, Y. Prevalencia del consumo de farmacos en la ciudad de La Paz, B.C. Cuadernos Cientificos CEMESAM (Mex) 9:93-106, 1978.

Medina-Mora, M.E.; Castro, M.E.; and Terroba, G. Drug Use among Youth Population, Mexico. Paper presented at the WHO meeting of collaborative investigators in the research and reporting project on the epidemiology of drug dependence. University Sains Penang, Malaysia, 1979.

Medina-Mora, M.E.; Ryan, P.; Ortiz. A.; Campos, T.; and Solis, A. A methodology for intensive case finding and monitoring of drug use in a Mexican community. Bull Narc XXXII(2):17-26. 1980.

Medina-Mora, M.E.; Ortiz, A.; Caudillo, C.; and Lopez, S. Inhalacion deliberada de disolventes en un grupo de menores Mexicanos. Salud Ment 5(1):77-86, 1982.

Medina-Mora, M.E.; Garcia, Z.G.; Rascon, M.L.; and Otero, M.R. Encuesta sobre el uso de Sustancias Psicoactivas en la Poblacion de 14 Anos y mas de la Cuidad de Morelia, Mich. Investigacion en Proceso (Research in Progress), Instituto Mexicano de Psiquiatria, 1986.

Mier y Teran, C.; Schnaas, L.; Vargas, G.; and Belsasso, G. Farmacodependencia en una carcel de mujeres en la Ciudad de Mexico. Cuadernos Cientificos CEMEF (Mex) 1:67-97, 1974.

Natera, G. Study on the incidence of use of volatile solvents in 27 centers in Mexico. In: Sharp, C.W., and Carroll, L.T., eds. Voluntary Inhalation of Industrial Solvents. National Institute on Drug Abuse. DHEW Pub. No. (ADM) 79-779. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1978. pp. 41-57.

Natera, G., and Terroba, G. Consumo de farmacos en la Ciudad de Monterrey, N.L. Cuadernos Cientificos CEMESAM (Mex) 11:101-122, 1979.

Natera, G.; Zubieta, M.; and Orozco. C. Epidemiologia de la farmacodependencia en 27 centros de tratamiento de la Republica Mexicana. Cuadernos Cientificos CEMESAM (Mex) 11:51-98, 1979.

Ortiz, A., and Caudillo, C. Family characteristics of inhalant users and non inhalant users. Unpublished Report, 1985.

Parra, A., de la; Medina-Mora, M.E.; Terroba, G.; and Rubio, S. Estudios epidemiologicos sobre consumo de farmacos en la ciudad de Puebla, Pue. Cuadernos Cientificos CEMESAM (Mex) 11:14-15, 1979.

Parra, A., de la; Medina-Mora, M.E.; Terroba, G.; and Saltijeral, T. Estudios epidemiologicos sobre consumo de farmacos en la ciudad de San Luis Potosi, SLP. (A traves de encuestas de hogares.) Cuadernos Cientificos CEMESAM (Mex) 11:12-13, 1979b.

Ruiz de Chavez, L. Marginalidad y conducta antisocial en menores. Cuadernos del Instituto Nacional de Ciencias Penales 1 (Mex) 1978.

Ruiz-Harrel, El consumo ilicito de drogas en una poblacion penitenciaria. Ediciones de la Procuraduria General de la Republic Mexicana (Mex) 1974.

Safa-Barraza, E.; Mier y Teran, C.; and Zermeno, G. Investigacion epidemiologica sobre el uso y abuso de farmacos en los penales del D.F. Reportes Especiales CEMEF (Mex) 1973.

Sanchez-Huesca, R., and Ortiz-Mondragon, R. Vision Epidemiologica sobre la Farmacodependencia en Centroamerica y el Caribe. Investigacion Documental. Reporte Interno (Internal Report), Centros de Integracion Juvenil, Mexico, 1984.

Schnaas, L. Caracteristicas psicosociales de un grupo de internos farmacodependientes. Serie Investigaciones/2. Biblioteca Mexicana de Prevencion y Readaptacion Social. Instituto Nacional de Ciencias Penales, Mexico, 1976.

Secretaria de Gobernacion. El perfil del menor infractor en Mexico. Ano Internacional del Nino. 1979. Reimpreso.

Smart, R.; Medina-Mora, M.E.; Terroba, G.; and Varma, U.K. Drug use among non students in three countries. J Drug Alcohol Depend 7:125-132, 1981.

Solorzano, A. Estudio de mil casos de ninos dedicados al comercio ambulante y los servicios en la Ciudad de Mexico. Cuadernos INET (Mex) 9:97, 1979.

Suarez, C. Prevalencia del consumo de drogas en un centro de readaptacion estatal. Cuadernos Cientificos CEMESAM (Mex) 11:144-170, 1979.

Terroba, G., and Medina-Mora, M.E. Epidemiologia de la farmacodependencia en la ciudad de Mexicali, B.C. (A traves de encuestas de hogares.) Cuadernos Cientificos CEMESAM (Mex) 11:45-46, 1979.

Villaforte, F. Donde empieza el silencio. Genealogia de las bandas juveniles. Series de Avances en Investigacion. Centro de Estudios sobre la Juventud Mexicana, 1985.

Wellisch, D., and Hays, J.R. A cross cultural study of the prevalence and correlates of student drug use in the United States and Mexico. Bull Narc XXIV:31-54, 1974.

AUTHORS

Elena Medina-Mora, Ph.D.
Arturo Ortiz, Ph.D.
Instituto Mexicano de Psiquiatria
Antiguo Camino a Xochimilco #101
14 370 Mexico, D.F.

Social and Psychological Factors Underlying Inhalant Abuse

E. R. Oetting, Ph.D., Ruth W. Edwards, M.B.A., and Fred Beauvais, Ph.D.

INTRODUCTION

People inhale a large number of different materials for their psychoactive effects. The substances that are used most frequently are gasoline, glue, and paints, but there are an almost limitless number of aromatic or gaseous materials that can be inhaled and that produce psychoactive effects. The biochemical and psychological effects of these substances differ and inhalant users will take specific inhalants depending on availability and on their current drug mythology and beliefs. In general, however, substances that are gases or that emit gases at room temperature which can be inhaled for their psychoactive effects fall into two broad groups.

One group of substances--drugs such as nitrous oxide, the amyl and butyl nitrites, chloroform, ether, etc.--produce transient and very specific effects. These substances are expensive, are hard to obtain, are used mainly by older polydrug users on an occasional basis, or are used by population subgroups for specific purposes (i.e., the use of the nitrites, "poppers" and "snappers," in association with sex). While these substances may produce problems in their own right, they are not relevant to the type of chronic inhalant use or inhalant dependence that we discuss here and are not considered further in this chapter.

The other inhalant group consists of a wide range of aliphatic and aromatic hydrocarbons found in such materials as glues, gasoline, and paint thinners. Less commonly used are halogenated hydrocarbons found in spray can propellants, paper correction

fluid, and some cleaning liquids. Occasionally, substances containing esters, ketones, and glycols are sniffed. Among this shopping list of chemicals are those that are used by nearly all drug users who are seriously involved with inhalants. All of these various inhalants are cheap and readily available. Most of the substances that are sniffed contain mixtures of various materials, so it is almost impossible to consider differences related to the actual chemicals involved. Although some substances may be preferred by some users, these inhalants are often used interchangeably. Beauvais and Oetting (1987) suggest using the diagnosis "inhalant dependent" only for users of this latter class of drugs.[1] (See also the Diagnostic and Statistical Manual of Mental Disorders III-R, 1987.) When we discuss inhalant use in this chapter, it refers to use of the chemicals in this group.

TYPES OF INHALANT USERS

There are three main types of inhalant users: (1) inhalant-dependent adults, (2) polydrug users, and (3) young inhalant users. Nearly all inhalant users in the United States fall into one of these three groups. This classification derives from an evaluation of the literature and the analysis of thousands of school-based surveys we have collected over the past 10 years. It is very interesting to note, however, how closely the types correspond to the typology presented by McSherry (this volume), who describes inhalant users from a clinical perspective.

There are some exceptions to the above three types, but they involve atypical and unusual circumstances. One type of exception would be the rare case of an adult inhalant user where there is little or no past drug use history. An example would be employment-induced dependence, where a person inhales fumes of a substance such as cleaning fluid in an industrial setting and then begins deliberate inhalation, using the same substance to get high. While technically these individuals are dependent on inhalants, they are not much like the long-term drug users who have moved to chronic inhalant abuse; and prevention and treatment needs will be different for these relatively rare patients. Other exceptions involve unusual cultural subgroups. An example would be the youth gangs of Mexico City where very young children are completely sundered from family relations and from other socialization links. Members of these youth gangs use inhalants very heavily (Leal et al. 1978). Medina-Mora Ortiz (this volume) describe these young gangs and their problems in considerable

detail. Another example would be certain "punk" gangs in England, where the "glue bag" is carried as a symbol of group membership and resistance to authority (Kerner, Personal Communication, September 1986). Groups such as these are inhalant users, but they represent isolated responses to unique cultural situations. In contrast to these idiopathic clinical cases and unique groups, the three types that we have listed appear in most U.S. locations, and members of such types are quite similar to each other even if from different locations.

Inhalant-Dependent Adults

Membership in this group would be defined by the person's constant and heavy use of inhalants. This group consists almost entirely of long-term drug and alcohol users for whom inhalants have become the drug of choice. They get high on inhalants frequently (often every day); and they stay high for long periods of time, often 6 hours or more. Most are in their twenties or thirties, although a very few may be younger or older. Streicher et al. (1981) note that these inhalant-using adults are quite rare compared with adults dependent on other forms of drugs, but that their inhalant use is likely to be very severe.

Nearly all young adults who are inhalant dependent also use other drugs; but inhalants are preferred because they are readily available, because intoxication is rapid, and because the state achieved is perceived as an exceptionally "good" high. The route of administration also offers an opportunity for fine control of the resulting high. Many users have a preferred level of intoxication. As an example, one patient reported that what he really liked was ". . . the feeling of just going over the top of the roller coaster." With any other drug, that feeling would be transitory. With inhalants, he could stay at or about this level of intoxication for long periods of time.

Adults who are inhalant dependent usually suffer from serious social and employment problems and often have legal problems as well. Inhalant users in general have a reputation for violence, for crime, and for other forms of deviance. This bad reputation of inhalant users is likely to be, at least in part, a result of the problems of these inhalant-dependent adults. Their difficulties may be a result of inhalant use, but adults who are dependent on inhalants are also likely to have been heavy drug and alcohol users and to have had serious adjustment problems even before their

inhalant involvement. When inhalant abusers end up in the hospital in coma, with imbalanced electrolytes, or with kidney failure, they are usually inhalant-dependent adults.

Polydrug Users

Polydrug users are typically adolescents who use drugs frequently, whose drug use plays a major role in most of their activities, and who use more than one type of drug, most often taking stimulants and at least one form of "downer" in addition to using marijuana heavily. Along with these other drugs, a few polydrug users also use inhalants. Inhalants are hardly ever the preferred drug; they merely provide one more effective way to get high.

The youth who uses multiple drugs has many problems, but these problems are rarely linked specifically to inhalant abuse. Polydrug users rarely use inhalants often enough or heavily enough to have physiological problems. They are not as likely to stay high on inhalants for hours at a time, and the resilience of youth provides for more recovery between bouts with the drug. While polydrug users may move on to further drug involvement, only rarely do they graduate to inhalant dependence. Occasionally, polydrug users will inadvertently overdose on inhalants, or become involved with an unfamiliar inhalant, and require medical attention. This is not typical, however, and will usually occur only once for any individual. This is in contrast to inhalant-dependent adults, who may have multiple admissions for dependence treatment or emergency medical care.

Young Inhalant Users

When young children are just getting started in drug use, they use one or more of three drugs: alcohol, marijuana, and/or inhalants. When a child just tries alcohol or uses a little with his or her family, it does not necessarily indicate drug involvement. On the other hand, when a child gets drunk with his or her friends, it is a mark of drug involvement. Some younger children also use marijuana, and a few use inhalants. The child who uses inhalants frequently is also likely to use alcohol and/or marijuana. When inhalants are used and no other drugs except alcohol or marijuana are used, the child would be classified as a young inhalant user.

Again, the low cost and ready availability of inhalants are a major factor in their use. Young children do not have the financial or

other resources to obtain many drugs. They can, however, get alcohol from older youth or parental supplies. Marijuana does not cost much and is readily available anywhere; and inhalants can be very cheap, plentiful, and easy for a child to obtain.

Another factor encouraging inhalant use by younger children may involve resolution of an approach/avoidance conflict. Taking other drugs may appear to children to be an either/or situation--you either take the pill or you don't take the pill. With inhalants (or, for that matter, marijuana), you can inhale a little, see how it feels, and then either try a little more or quit. It might be easy for a child who is both attracted to drugs and afraid of them to move, by successive approximations, into inhalant intoxication.

Most young inhalant users get high on inhalants, alcohol, or marijuana only a few times a month. An inhalant-using child could be seriously injured from burns, from suffocation, or from an unusual hypersensitive reaction; but, when used with reasonable care and used infrequently, inhalants probably do only minimal damage. Fortunately, the drugs most often used by young inhalant users, gasoline and toluene, are probably among the least damaging of the inhalant arsenal. Nevertheless, young inhalant users are getting early experience with drugs, they are learning to use drugs as an adjunct to recreational activities, and they are in grave danger of deepening drug involvement as they get older, with all of the accompanying problems of more serious drug use.

While most children do not use drugs very often, some children, even very young children, can get very heavily involved with inhalants. This kind of extremely heavy inhalant involvement can suddenly appear as a local epidemic in one or two age cohorts. A small group of children will start using inhalants very heavily. Suddenly other groups of children begin doing the same thing, until many different "gangs" of children are spending much of their time seeking out and using inhalants. This kind of heavy inhalant epidemic among young children is most likely to happen in economically disadvantaged and geographically or culturally isolated communities, but it can occur anywhere.

When children or adults use inhalants heavily, the dangers are very real. Many inhalants are toxic (Comstock and Comstock 1977). Inhalants can lead to renal dysfunction, central nervous system atrophy, and neuropsychological deficits (Korman et al. 1981; Fornazzari et al. 1983; Moss et al. 1980). Lead can be

absorbed from gasoline (Coulehan et al. 1983), and some materials can lead to sensitization of the heart and potential stoppage or fibrillation (Aviado 1977). In addition, very young children who are inhalant involved are likely to move to other drugs as they get older and gain greater access to other drugs. For data on involvement with other drugs, see Frank et al. (this volume).

In the U.S., more than 15 percent of youth will, at some time, try inhalants (Johnston et al. 1986). In some populations, such as barrio Hispanic youth or Native Americans who live on reservations, more than a third of young people will try inhalants before they are 18 years of age (Beauvais et al. 1985a; Padilla et al. 1979).

What can be done to reduce inhalant use and its attendant dangers? With some drugs, it may be possible to limit the supply, although that has not worked particularly well in the past. But the supply of inhalants cannot be interdicted. Hobby shops, hardware stores, and the kitchen cupboard are replete with inhalable substances. The car's gas tank is right outside the door. The only feasible attack on inhalant use is to reach the people who are using inhalants and change their behavior. In order to develop creative and effective attacks on inhalant use, therefore, we need to know what inhalant abusers are like. How do inhalant users differ from people who do not use drugs? How do they differ from people who use other drugs?

PSYCHOLOGICAL AND SOCIAL UNDERPINNINGS OF INHALANT USE

Attribution of Causation

Most of the data that are available in the literature on inhalant users are descriptive and correlational. The data show that inhalant users have certain characteristics, but were those characteristics a result of inhalant use or were they factors that were in existence before inhalant use began? Were they causes or effects? As an example, when we first started studying young inhalant users over a decade ago, there were persistent clinical reports of severe brain damage resulting from inhalant abuse. We did find one Native American fourth grade girl who was supposed to have "burned out" her brain by using inhalants. She could not read or write. But, on further examination, we could find no evidence that she had ever been able to read and write. While

220-583 0 - 88 - 7 : QL 3

inhalants could have led to neurological damage, it was somewhat more likely that the frustration and anxiety involved in trying to do schoolwork were among the factors that led her into drug use. Chronic inhalant use could then have been one of the factors that prevented further growth.

Long-term longitudinal studies could show that some characteristics were related to inhalant use and also occurred earlier than inhalant involvement and that they were, therefore, likely to be causes of that use. Longitudinal studies that address this problem have not, however, been done. We must rely, at this time, on careful examination of data obtained from inhalant users and interpret it as carefully as possible within a logical framework. For example, while inhalant abuse can lead to or exacerbate social and psychological problems, when those social or psychological factors are persistent and long-term characteristics, those traits are likely to have been present to some extent before the inhalant use started. They are likely to be, at least in part, the causes of inhalant involvement.

Design of the Study of Young Inhalant Users

In the following sections, we discuss what is known from the literature about inhalant users and add information from our own research. Much of our research data have been published, as cited in the discussion. We have, however, also included a number of tables that present as yet unpublished study data comparing young inhalant users, young marijuana users, and youth who use no drugs. The results were obtained as follows.

Anonymous surveys were administered to youth in the 7th through 12th grades in several mid-American communities. The young inhalant user sample consisted of 50 youth, ranging in age from 12 to 17, with a mean age of 14.8; 56 percent were female. All used inhalants during the last month, but were not using any other drugs except for marijuana and alcohol. Young inhalant users were matched with a group of young marijuana users, youth who used only marijuana and alcohol. Sex was matched and total drug involvement was matched, so that both subject groups had gotten high about the same number of times during the last month. Age was matched as closely as possible but, because inhalant users tended to be younger and more drug involved, it was sometimes necessary to match an inhalant-using youth with a slightly older marijuana-using child in order to obtain the same level of drug

involvement. A third group, with no drug use, was selected based on matched sex and age. The following table compares the drug involvement of these three groups.

TABLE 1

Drug Involvement of Young Drug Users

	Mean Number of Times Used in Last Month		
	Alcohol	Marijuana	Inhalants
Young Inhalant Users	2.1	1.0	4.0
Young Marijuana Users	4.6	4.9	0
No Drug Use	0	0	0

	Mean Self-rating as a User*		
	Alcohol	Marijuana	Inhalants
Young Inhalant Users	2.1	1.0	1.6
Young Marijuana Users	2.1	1.8	0.1
No Drug Use	0	0	0

*(1 = very light, 2 = light, 3 = moderate, etc.)

Young inhalant users use all three drugs, but are using inhalants more often than the other two drugs. Young marijuana users use marijuana and alcohol about the same number of times and, as selected for this group, have no current inhalant use. A very small number of them have used inhalants in the past and still see themselves as inhalant users. The two drug-using groups are very distinct from each other in their drug involvement although they use drugs at the same rate, a total of about five times a month. The no-drug-use group not only shows no current use, but also shows no self-perception as a user of any drug.

The tables in the following discussion show how these groups differ on psychological and social characteristics. The alpha

reliabilities of the scales assessing psychological and social characteristics range from .82 to .93; and content, discriminant, and construct validity have been demonstrated for most of these measures. Data on the scales appear in Oetting et al. (1984).

The discussion of the correlates of inhalant use has been divided into sections. The first section deals with social structure: age, sex, socioeconomic status (SES), and ethnicity. The second section covers the involvement of peers in inhalant use. The third section discusses the major socialization variables: community, family, school, religion, and peers. The fourth section deals with psychological characteristics: deviance, social adjustment, and emotional problems.

SOCIAL STRUCTURE

Age

In this chapter, we define three separate groups of inhalant users: inhalant-dependent adults, polydrug users, and young inhalant users. The three types of inhalant users involve overlapping but different age ranges. A majority of those who are inhalant dependent are from 24 to 35 years old. Most polydrug users are in the 14- to 20-year age group, with a modal age of 15 to 16. Young inhalant users may be as young as 8 or 9 years old, but the modal ages would be 12 to 13, and most would be from 11 to 16.

In general, inhalants are a drug of the young and sometimes of the very young. Inhalant use has been found among very young children, particularly those from American Indian reservations and Hispanic barrios (Boeckx et al. 1977; Kaufman 1972; Beauvais et al. 1985a). This volume includes a chapter by Beauvais and Oetting summarizing what is known about inhalant use by children under 12 years of age.

Peak use of inhalants occurs somewhere between the ages of 11 and 13, depending on the group surveyed (Beauvais et al. 1985a; Stephens et al. 1978). After the age of 13, the percent using inhalants drops steadily, even while use of other drugs increases (Beauvais et al. 1985a; Fishburne et al. 1980).

An unusual finding is that the percent of youth who have "ever tried" inhalants is likely to drop between the 8th and 12th grades; for an example, see the 1983 data presented by Frank et al. (this

volume). On the surface, this is illogical. As children grow older, those who tried a drug at an earlier age should still indicate they have tried the drug. The percent who "ever tried" a drug should, therefore, constantly increase with age and should never decrease with age.

One explanation for the aberrant inhalant finding, where there is a decrease with age, may be that high school seniors have forgotten that they tried inhalants when they were younger. "Ever tried" rates, however, increase appropriately for every drug except inhalants. The question is, why should high school seniors forget only their inhalant use? Another similar, and perhaps more reasonable, hypothesis is that older youth view inhalant use as "kid stuff" and therefore deny that it happened. Still another possibility is that 8th graders classify behaviors as inhalant use that they would not classify the same way when they are more sophisticated 12th graders. Beauvais (1986) cites the example of the girl who stated, "Oh, yes, we like the smell of the paper when it comes out of the duplicator" (p. 3). We find, however, that 8th graders who report inhalant use are also likely to report marijuana and alcohol use and that they have other problems as well, problems that are likely to be associated with real drug use and not with this kind of innocuous experience.

One potentially important possibility is that there is a relatively high dropout rate among inhalant users (Annis and Watson 1975)--that many of those who get involved with inhalants by the 8th grade are no longer in school by the time their class reaches the 12th grade. Further studies of this hypothesis could be very important, since both Hispanic and Native American groups tend to have high rates of inhalant use and also have high dropout rates.

Gender

Early studies of deviant groups, such as delinquents or psychiatric patients, showed much higher rates of inhalant use among males (Cohen 1973; Korman et al. 1980). The National High School Senior Survey (Johnston et al. 1988) shows that 20.1 percent of males have tried inhalants compared with 14.2 percent of females. Smart's chapter (this volume) indicates more male users in most Canadian locations, but equivalent rates of use in one Canadian city. Among Native Americans, where there are much higher rates of use, there are only small sex differences (Beauvais et al.

1985a). In one study, while western smalltown Anglo females had lower rates of inhalant use than males, Hispanic females had the same rate of use as males (Chavez et al. 1986). Mata and Andrew, however, report (this volume) on another study of Texas small towns, where they find higher male than female involvement. In general, sex differences tend to favor male rather than female involvement, but there are many exceptions, particularly among minority groups; and Rosenberg et al. (1974) speculate that over time trends will be toward more equal male and female involvement.

There may be another explanation for the variability in gender differences across studies. Inhalant use, more than the use of most other drugs, seems to be highly susceptible to local influences. One reason for those local differences may be that inhalants are a drug of the young, and young children are more sensitive to local environments and less sensitive to broad-scale social influences than are older youth. The gender differences found in different locations may occur because 12- to 14-year-olds, the inhalant-using ages, tend to have same-sex friends. A local epidemic could, then, be centered around use either by girls or by boys and not spread as rapidly to the other sex as it would at ages where the sexes commingle.

Ethnicity and Socioeconomic Status

Several studies report that low SES relates to inhalant use (Ellinson 1964; Medina-Mora et al. 1978; Streicher et al. 1981). Other studies, however, show no differences related to SES (Gosset et al. 1971; Press and Done 1967; Stephens et al. 1978). While these results on SES may appear contradictory, they can be readily explained. Inhalants are a drug of the young. When only adults are surveyed, inhalant use may be rare and there may be no differences related to either SES or ethnicity.

Further, the heaviest inhalant involvement has been found among members of minority groups, particularly those who live in barrios or on Indian reservations (Beauvais et al. 1985a; Boeckx et al. 1977; Nurcombe et al. 1970; Padilla et al. 1979). If a survey did not include significant numbers of these hard-to-reach minorities, it might not show differences between socioeconomic groups. Surveys that do include younger children from barrios or reservations consistently show high inhalant use among those children.

PEERS AND INHALANT USE

The most striking example of peer influence on inhalant use appears in the study of street children in Mexico City (Leal et al. 1978; Medina-Mora and Ortiz, this volume). Kids in these street gangs come from impoverished families, and many have just moved from the hinterland into the slums on the outskirts of the city. Gang members have almost entirely broken with their families and are living together in small groups. The group becomes a substitute family, but one with no sanctions against use of drugs; in fact, the "family-like" roles played by certain members of the group may be centered around acquisition and use of inhalants.

In more normal situations, most studies report that young inhalant users sniff inhalants in small groups; although once the behavior is established, some may use drugs when alone (Clements and Simpson 1978; Cohen 1978; Kaufman 1972; Medina-Mora et al. 1978; Nurcombe et al. 1970). A large percent of the friends and/or siblings of inhalant users also use inhalants (Smart et al. 1970a; Stephens et al. 1978); and users usually report that they first started taking the drugs at the urging of friends or relatives (Berriel-Gonzalez et al. 1978; Mesteth 1968).

Beauvais et al. (1985a) provide data showing the critical importance of peers in inhalant use. Inhalant use is very prevalent among Indian youth, and more than one-third will eventually try inhalants. Of young Native Americans who report low encouragement to use inhalants from their friends and whose friends would apply strong sanctions against using inhalants, only 19 percent had tried inhalants at some time, and only 3 percent had used them recently. By contrast, when friends strongly encouraged inhalant use and would not try to stop inhalant use, 84 percent had tried inhalants and 41 percent had used them recently.

Oetting and Beauvais (1986) present a model called "peer cluster theory" that relates to adolescent drug use. They propose that a wide range of social and psychological factors make an individual susceptible to drug use; but, when drug use actually occurs, it almost always occurs as a reflection of the peer cluster. Friends and siblings provide access to drugs and teach the youth how to use drugs. When youth who are best friends or members of small gangs form a drug-using peer cluster, they share their beliefs and

ideas, generate the rationales that the group will use to decide where and when drugs will be used, and decide what drugs will be used. Most drug use then takes place within the context of these peer clusters. Our data on young inhalant users show a very strong relationship between inhalant use and peer drug associations that involve inhalants. The following table shows mean scores for peer drug involvement for young inhalant users and for young marijuana users.

TABLE 2

Peer Drug Associations of Young Drug Users

	Peer Drug Associations*		
	Alcohol	Marijuana	Inhalants
Young Inhalant Users	1.54	1.26	1.2
Young Marijuana Users	1.81	1.76	0.57
No Drug Use	0.46	0.18	0.19

*Based on the following question for alcohol, marijuana and inhalants:

How many of your friends use (drug)?

_____most of them (3)
_____some of them (2)
_____a few of them (1)
_____none (0)

The measures of peer drug associations involve items asking whether a youth's friends use that drug, how much those friends encourage use of that drug, and how strongly they would try to stop use of that drug. Peer alcohol associations are high for both marijuana- and inhalant-using youth. Marijuana-using youth, however, have significantly higher levels of peer marijuana associations and young inhalant users have significantly higher peer inhalant associations; these results confirm that youth who use particular drugs tend to have friends who also use those drugs and who encourage use of those specific drugs.

There is a persistent idea that inhalant users are more likely to be solitary drug users--to use drugs alone. Solitary use, however, occurs predominantly among inhalant-dependent adults. Among young inhalant users, peer clusters operate strongly to either encourage or suppress inhalant use and inhalant use occurs almost entirely within the structures of those peer clusters. Any attack on the problem of young inhalant users must take the youth's peer clusters into account if it is to be successful. The peer cluster will draw the youth back into inhalant use if it is given the chance to do so. Prevention efforts need to stop the formation of inhalant-using peer clusters; but, what are the factors that lead some youth to join peer clusters that will use inhalants while others join or form peer clusters that do not use inhalants? The following sections discuss the social and psychological correlates of inhalant use, the factors that may make a youth susceptible to inhalant involvement.

SOCIALIZATION VARIABLES

The child learns about society, about how to behave, about how to do things, about what is "right" and what is "wrong," and about values and attitudes from his or her links with various groups and institutions. The major socialization forces for most young people are the community, the schools, religious groups, the family, and peers. As indicated above, the dominant factor in inhalant use is peer relationships, but each of these other socialization links also has some influence, helping to either inoculate a youth against drug use or increase that youth's susceptibility to drug involvement. Peer relationships are considered in the previous section. While religion is an important socialization link (Oetting and Beauvais 1986), this study did not include data on religion. The other factors are discussed below.

Community

The community provides a base within which all of these other socialization links must function. The community can have very strong effects by itself. Nurco et al. (1984) have shown, for example, that there are certain census tracts that have a high level of general social pathology and that drug use is high in these census tracts. Living in a "bad" neighborhood can mean that a youth is constantly exposed to drug-using role models, seemingly rich "pimps" and "pushers," and that drugs of all kind are readily available for experimentation. In some places, a youth must join a

neighborhood gang to survive, and the gang can push drug use. Inhalant use is not, however, limited to "bad" neighborhoods.

When younger children in a community use inhalants heavily, it can suggest sniffing to the next age cohort as they grow up. Disadvantaged Hispanic communities and Indian reservations have these existing high levels of youth inhalant use and have ongoing epidemics of inhalant use among the young (Beauvais et al. 1985a, 1985b). A local epidemic, however, can occur in any community. Swaim et al. (1986) have noted that inhalant use varies a great deal across rural communities. The differences at the 12th grade level are not great, but there can be very large differences between communities at the 8th grade level, suggesting that a highly localized epidemic of inhalant use among younger children may occur in one small town and not in neighboring towns. By the time youth in small towns are in the 12th grade, however, they have moved away from inhalant use and there seems to be enough cross-communication among teenagers that differences in use of other drugs across small towns disappear.

Family

Disrupted family structure is almost always found in studies of chronic inhalant users. Even if the family is intact, family relationships, particularly those with the father, are poor (Babst et al. 1978; Barker and Adams 1973; Gilbert 1983; Harbin and Mazier 1975; Press and Done 1967). Many studies also show considerable alcohol and drug abuse by parents of inhalant abusers (Barnes 1979, 1980; Berriel-Gonzalez et al. 1978; Blatherwick 1972; Gutierrez et al. 1978; Massengale et al. 1963; Smart et al. 1970b).

Table 3 compares family relationships of young inhalant users with those of young marijuana users and nondrug-using youth.

The young inhalant users do not show the highly disrupted family structure that has been noted in other studies of inhalant users. Table 3 shows the percent of intact families by drug user type; "intact" in this case is not merely where parents are still married but also where the child lives with both parents. While drug-using youth have greater family breakdown than nondrug users, the least intact families are associated with marijuana use, not with inhalant use.

TABLE 3

Family Relationships of Young Drug Users

	Mean Item Score		
	Family Intactness	Family Cares*	Family Sanctions Against Drugs**
Young Inhalant Users	32.0%	[3.78]	[3.77]
Young Marijuana Users	27.2%	[3.81]	[3.77]
No Drug Use	40.8%	[3.84]	3.95

Boxed items in any column are not significantly different.

Typical items:

* My family cares about me.

_____a lot (4)
_____some (3)
_____not much (2)
_____no (1)

** My family would try to stop me from using drugs.

_____a lot (4)
_____some (3)
_____not much(2)
_____no(1)

Young inhalant users were the lowest of all groups in their feeling that the family cares about them, but the differences across groups were not significant. The mean scores for family caring, in fact, show that young people have very strong feelings that their families do care about them and that this is true for both young drug users and youth who do not take drugs.

Why do our results differ from those reported in other studies where inhalant users show serious family breakdown? If we had compared inhalant-using youth only with nondrug-using youth, as some other studies have done, we would have found greater family disruption in the families of inhalant users. Since we included young marijuana users, we find that family breakdown is related to drug use in general, not only to inhalant use. Another reason that other studies may present somewhat different results may center around the need to distinguish between the three types

of inhalant users. Inhalant-dependent adults are very seriously disturbed--their behavior is analogous to that of heroin addicts. The fact that they have histories of serious family disruption would not be surprising. Polydrug users who are heavily involved with inhalants are also likely to be deeply drug involved and are more likely to be from impoverished and disadvantaged families who live in barrios or in similar problem environments. They too would be expected to have serious family disruption. Young inhalant users, on the other hand, while they are more drug involved than other youth, are not as extreme in their drug involvement. The family disruption that seems to especially mark older inhalant users may not be quite as serious in this group of young inhalant users.

It is likely, however, that both marijuana-using and inhalant-using youth have more family disruption than table 3 suggests. The nonsignificant differences in this table are in the direction of greater family problems, and those differences may increase as these very young children become older adolescents. Furthermore, when there is a strong family, it applies strong family sanctions against using drug--the strong family would, typically, do everything in its power to stop a child from using drugs. In our data, nondrug-using youth feel very strong family sanctions against using drugs. Both marijuana-using and inhalant-using youth feel slightly weaker family sanctions. Since family sanctions are inextricably linked to family strength, there may be more disruption in the families of drug-using youth than is seen here, family disruption that will become apparent as they mature.

School Adjustment

Many studies have shown that inhalant users have educational problems (Ackerly and Gibson 1964; Galli 1974; Kandel 1975; Massengale et al. 1963; Medina-Mora et al. 1978; Nurcombe et al. 1970; Schottstaedt and Bjork 1977). Barnes (1980) and Korman et al. (1980) indicated that this poor school adjustment is not necessarily a function of low intelligence. Inhalant users also have high truancy rates and high dropout rates (Barnes 1980; Stephens et al. 1978; Medina-Mora et al. 1978). Korman (1977) has also noted that inhalant users have problems with school authorities.

The inhalant users' problems in school could be related to intellective deficits from neurological problems. Impairment in cognitive functioning of inhalant users, for example, has been

reported in several studies (Allison and Jeromm 1984; Berry et al. 1978; Korman et al. 1980; Fornazzari et al. 1983). Chronic inhalant use has a reputation for causing cognitive impairment; although, as we have noted, it is also possible that some individuals with cognitive impairment have a penchant for using inhalants.

Unfortunately, we do not have current data on school performance of inhalant users. We do have a measure of whether they like school, an important factor in school adjustment since dislike of school can be related to both poor performance and dropout. Table 4 compares liking for school of young inhalant users and young marijuana users.

TABLE 4

Liking for School of Young Drug Users

	Mean Item Score Liking For School*
Young Inhalant Users	2.69
Young Marijuana Users	2.65
No Drug Use	3.09

Boxed items are not significantly different.

*Typical item: I like school.

_____a lot (4)
_____some (3)
_____not much (2)
_____no (1)

Young inhalant users show less liking for school than nondrug users, but not less liking than that of young marijuana users. The severe school adjustment problems noted in the literature may be more characteristic of inhalant-dependent adults and of adolescent polydrug users who use inhalants. Among younger children,

school adjustment problems may be a general factor related to all kinds of drug use rather than being specific to inhalant use.

PSYCHOLOGICAL CHARACTERISTICS

Deviance

Reed and May (1984) have reviewed the literature and found a strong relationship between crime and inhalant abuse. Several studies report that inhalant users can be very aggressive and violent (Cohen 1973; Korman et al. 1980; Reed and May 1984). There is an impression that it is inhalant intoxication that encourages aggressive behavior, but it is also possible that those with high aggressive tendencies tend to prefer inhalants. Korman (1977), for example, pooled data from two Minnesota Multiphasic Personality Inventory studies and reported that inhalant users were high on psychopathic deviance, schizophrenia, and mania. Those scales assess relatively permanent personality features related to aggressive and antisocial behaviors, characteristics that are likely to have been present long before inhalant abuse began.

Of the three types of inhalant users, inhalant-dependent adults and adolescent polydrug users are likely to be highly deviant, while young inhalant users may not be as deviant. The studies that show high levels of psychopathology, aggressive behavior, and violence involve either inhalant-dependent adults or adolescent polydrug users. Both groups are highly involved with drugs and include individuals who have long histories of drug abuse. Oetting and Beauvais (1983) and Oetting et al. (1984) show that heavy drug users are likely to be highly deviant: They do not believe that it is wrong to lie, cheat, or steal; and they engage in a wide variety of deviant and delinquent activities. Young inhalant users, however, do not have this long history of drug involvement and may not be as deviant.

Table 5 shows the differences in deviance between matched groups of young inhalant users, young marijuana users, and nondrug users.

TABLE 5

Deviance of Young Drug Users

	Mean Item Score	
	Tolerance of Deviance*	Deviant Behaviors**
Young Inhalant Users	[1.55]	[1.98]
Young Marijuana Users	[1.50]	[1.91]
No Drug Use	1.22	1.62

Boxed items in any column are not significantly different.

Typical items:

* Is it bad to cheat?

_____a lot (4)
_____some (3)
_____not much (2)
_____no (1)

** I steal.

_____a lot (4)
_____some (3)
_____not much (2)
_____no (1)

In general, the drug-using youth have a greater tolerance for deviance and engage in more deviant behaviors than the nondrug-using youth, The young inhalant users, however, are not more deviant than the young marijuana users. The other research findings that note greater criminality, aggression, and general deviance of inhalant users may only be relevant for inhalant-dependent adults and adolescent polydrug users and not for young inhalant users.

Social Adjustment

The general adjustment problems of inhalant-dependent adults and of polydrug users suggest that they would also have problems in social adjustment. The literature, however, does not address these issues directly. The following table shows what we found in comparing young marijuana users with young inhalant users.

TABLE 6

Social Adjustment of Young Drug Users

	Mean Item Score		
	Confidence*	Acceptance**	Alienation***
Young Inhalant Users	3.04	3.17	1.85
Young Marijuana Users	3.02	3.47	1.60
No Drug Use	3.06	3.37	1.68

Boxed items in any column are not significantly different.

Typical items:

*I am able to do things well.

_____a lot (4)
_____some (3)
_____not much (2)
_____no (1)

**Other kids ask me to do things with them.

_____a lot (4)
_____some (3)
_____not much (2)
_____no (1)

***People pick on me.

_____a lot (4)
_____some (3)
_____not much (2)
_____no (1)

There are no differences between the groups in self-confidence. Marijuana users were, however, somewhat higher in feeling that they were socially accepted. Perhaps marijuana, even at these young ages, is a "party drug" and is being used by youth who are more prone to party together. This, in turn, could be related to feelings of being socially accepted. Feelings of social acceptance are lowest in inhalant users, but the difference is not significant.

There is, however, a considerable difference in feelings of alienation--for example, feelings that "other kids hate me," "people pick on me," etc. Young inhalant users tend to be more alienated than other youth. These feelings of alienation could be important factors leading a youth to find other alienated youth and leading the resulting peer cluster toward inhalant use.

Emotional Problems

A few studies have found that inhalant users have higher levels of psychopathology (Alapin 1972; Comstock 1978; Korman 1977; Korman et al. 1980). Other studies have shown high levels of depression and, sometimes, suicidal ideation (Barnes 1980; Gutierrez et al. 1978; Massengale et al. 1963; Torres-Ruiz et al. 1976). High levels of anxiety have also been reported by some of these authors.

As with other variables, the extent of pathology and of other personality problems may depend on the type of inhalant user. Of the three types of inhalant user, inhalant-dependent adults are likely to show the most pathology. They are usually long-term alcohol and drug users with very serious and long-standing adjustment problems.

Polydrug users, however, may not have serious emotional problems. One of the more tempting theories of drug abuse is that people self-medicate with drugs--that they are anxious or depressed and take drugs to alleviate negative affect. Research studies, however, show only small relationships between drug use and emotional problems. When correlations are found, they tend to be low and inconsistent (Carlin et al. 1978; Kimlicka and Cross 1978; Labouvie 1986; White et al. 1986). Even retrospective and longitudinal research studies do not show much of a relationship between emotional problems and drug use (O'Malley 1975; Ginsberg and Greenley 1978; Orive and Gerard 1980). Our own research on adolescent drug use shows significant, but very low, correlations between emotional problems and adolescent drug involvement (Oetting et al. 1984).

It is not likely, therefore, that the inhalant use that plays a relatively minor role in adolescent polydrug use is related to emotional problems. The results, however, are very different when we examine young inhalant users.

Young marijuana users show no more emotional problems than nondrug users. Inhalant users, however, are more depressed, are more anxious, feel that they are blamed, and experience greater anger.

TABLE 7

Personal Adjustment of Young Drug Users

	Mean Item Score			
	Depressed*	Anxious**	Feels Blamed***	Angry****
Young Inhalant Users	2.10	2.91	2.29	2.83
Young Marijuana Users	1.80	2.25	1.93	2.32
No Drug Use	1.82	2.38	1.74	2.14

Boxed items in any column are not significantly different.

Typical items:

* I feel sad.

_____ a lot (4)
_____ some (3)
_____ not much (2)
_____ no (1)

** I feel tense.

_____ a lot (4)
_____ some (3)
_____ not much (2)
_____ no (1)

*** People blame me when things go wrong

_____ a lot (4)
_____ some (3)
_____ not much (2)
_____ no (1)

**** I get mad.

_____ a lot (4)
_____ some (3)
_____ not much (2)
_____ no (1)

These findings are very important. Most research on drug use does not show a clear pattern of emotional problems among drug-using youth and, in fact, emotional problems do not to appear to be higher in marijuana-using youth. Young inhalant users are different from other young drug users; they are experiencing more emotional problems. Is it the use of inhalants that leads to this difference? Probably not. These children are quite young. They do not use inhalants very much, typically only a few times a month. It is unlikely that inhalant use has "caused" these negative emotional states. It is more likely that children with emotional problems have a greater tendency to get involved with inhalants when they are young.

Are these young inhalant users "self-medicating"? Do inhalants, for some reason, relieve their negative emotional states better than marijuana? Is that why they have turned to inhalants? Do the emotional problems of young inhalant users cause them to find other youth with similar problems and join with them to find ways to deal with the stresses of life--ways that include inhalant use? Only further research on the emotional problems of young inhalant users can clarify this issue.

What is likely to happen to these young inhalant users in the future? Does the inhalant use exacerbate the existing emotional problems? These young inhalant users are not, at this time, more deviant than the marijuana users; but they are more angry and alienated. Do the anger and alienation grow over time and lead to the aggression and criminality that seem to be associated with later inhalant use?

There are no longitudinal studies of young inhalant users that tell us what will happen to them. We have indicated that there are three types of inhalant users, but do not know whether these types are independent or whether they link together. The data show that the inhalant use of young inhalant users is likely to drop off, but the higher level of personal problems and the early drug experience make it likely that inhalant use drops only when they move on to other drugs. Do some of these young inhalant users who have moved on to other drugs then return to inhalant use as part of a polydrug pattern? Is this early inhalant use, then, one of the factors that marks the rare individual who eventually becomes an inhalant-dependent adult?

SUMMARY

There are three distinct types of inhalant users: young inhalant users, adolescent polydrug users, and inhalant-dependent adults. Young inhalant users have a modal age of 12 to 13. They use inhalants and may also use alcohol and marijuana. They are likely to have more emotional problems than nondrug users or young marijuana users. These problems, particularly when they involve feelings of anger and alienation, increase the chances that they will identify with other youth who have similar feelings. When this happens, young people form peer clusters; they find a best friend or form a small gang that has a high potential for getting involved with drugs. Most of these peer clusters use inhalants only a few times a month, although some may become obsessed with inhalant use to the exclusion of nearly all other activities.

The data showing that young inhalant users have more emotional problems than either nondrug users or young marijuana users suggest that treatment should involve therapy as well as drug avoidance approaches. Every youth caught using inhalants, however, should not automatically be sent for therapy. Sometimes a youth caught using a drug is not really drug involved and overreaction can be damaging. In addition, the emotional problems of all young inhalant users are not identical. A higher average level of emotional problems only means that some of the young inhalant users have those problems, not all of them.

Older adolescents, including those who used inhalants earlier, are not likely to use inhalants. Since young inhalant users seem to be troubled youth, have shown an early penchant for drug use, and have drug-using associates, it seems unlikely that they quit using drugs. They probably move on to other drugs, leaving inhalants behind.

The older adolescents who do use inhalants are adolescent polydrug users, with a modal age of around 15 to 16. They take many different drugs, and some of them use inhalants as well. The adolescents who use inhalants are probably using a wider range of drugs than other adolescents and are probably getting high more often. Furthermore, they are likely to be more deviant and may be involved in more aggression and more crime.

Inhalant-dependent adults usually have a long history of alcohol and other drug involvement. At some point, inhalants have

become their preferred drug. By that time, they are usually in their midtwenties to early thirties. They have serious problems. They are more likely to be school dropouts and are likely to have poor work adjustment, although whether their adjustment deficits are a result of inhalant dependence or only one of the factors that led them to drug use is not known. Inhalant-dependent adults get high on inhalants often and frequently stay high for hours at a time. They may have kidney damage and blood electrolyte imbalances that can lead to hospitalization or coma. Inhalant-dependent adults also have a reputation for bizarre, impulsive, and dangerous behavior.

Inhalants do not have the romance and cachet of cocaine. They do not have the "taking care of business" mystique of heroin. They do not provide the exciting danger of phencyclidine (PCP). Inhalants do not even provide the drama of police chases and big drug busts. Sniffing gasoline or paint is a grubby, dirty, cheap way to get high. Inhalant users are, therefore, likely to be the social rejects, the emotionally disturbed, the disadvantaged minorities, the maladjusted, as well as angry and alienated. There is nothing attractive, exciting, or appealing about inhalant use or inhalant users and, in our attempts to deal with drug use, inhalants may be ignored. Far from being ignored, inhalant use should be a "red flag," a warning of the existence of a very serious problem.

At every age, inhalant use marks a very high general level of drug involvement for that age group and suggests potentially serious emotional and/or social adjustment difficulties. Young inhalant users are likely to have emotional problems. They started drug use earlier and are more deeply involved with drugs than other children. Adolescent polydrug users who also use inhalants are likely to use a wide range of drugs and to have social and legal problems. Inhalant-dependent adults are heavy chronic users, obsessed with using the drug, and likely to be seriously maladjusted. Each of these three distinct groups of inhalant users should be treated as a serious and separate social problem. More research is needed to determine what should and can be done, and adequate resources should be allocated to treat inhalant users and prevent inhalant use.

FOOTNOTE

[1] When inhalant users can get other chemicals, they will use them. For example, ether is sold in auto stores for starting cars, and

inhalant users will sniff this ether. The inhalant users we are discussing, however, use mostly glues, paints, and gasoline; and they are not "ether sniffers," a separate group that has appeared who use only ether.

REFERENCES

Ackerly, W., and Gibson, G. Lighter fluid sniffing. Am J Psychiatry 9:1056-1061, 1964.

Alapin, B. Trichlorethylene addiction and its effects. Paper presented at the 30th Congress on Alcohol and Drug Addiction, Amsterdam, 1972.

Allison, W., and Jeromm, D. Glue sniffing: A pilot study of the cognitive effects of long-term use. Int J Addict 19(4):453-458, 1984.

Annis, H., and Watson, C. Drug use and school dropouts: A longitudinal study. Can Counselor 9:155-162, 1975.

Aviado, D. Preclinical pharmacology and toxicology of halogenated solvents and propellants. In: Sharp, C.W., and Brehm, M.L., eds. Review of Inhalants: Euphoria to Dysfunction. National Institute on Drug Abuse Research Monograph No. 15. DHEW Pub. No. (ADM) 77-533. Washington, D.C.: Supt. of Docs., U.S. Govt. Print. Off., 1977. pp. 164-184.

Babst, D.; Deren, S.; Schmeidler, J.; Lipton, D.; and Dembo, R. A study of family affinity and substance use. J Drug Educ 8(1), 1978.

Barker, G., and Adams, W. Glue sniffers. Sociol 47:289-310, 1973.

Barnes, G. Solvent abuse: A review. Int J Addict 14(1):1-26, 1979.

Barnes, G. Northern Sniff: The Epidemiology of Drug Use Among Indian, White and Metis Adolescents. Winnigpeg: University of Manitoba, 1980.

Beauvais, F., and Oetting, E.R.; and Edwards, R.W. Toward a clear definition of inhalant abuse. Int J Addict 22(8):779, 1987.

Beauvais, F., and Oetting, E.R.; and Edwards, R.W. Trends in the use of inhalants among American Indian adolescents. White Cloud Journal, 3(4):3-11, 1985a.

Beauvais, F.; Oetting, E.R.; and Edwards, R.W. Trends in drug use of Indian adolescents living on reservations; 1975-1983. Am J Drug Alcohol Abuse 11(3 & 4):209-230, 1985b.

Beauvais, F. Social and psychological characteristics of inhalant abusers. Paper presented at WHO Group Meeting on the Adverse Health Effects of Volatile Solvents/Inhalants, Mexico City, April 1986.

Berriel-Gonzalez, R.; Berriel-Gonzalez, M.; Jauregui, R.; and Contreras-Cisneros, B. General characteristics of patient using volatile substances admitted to the Centro De Integracion Juvenil "Leon." In Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 61-74.

Berry, G.; Heaton, R.; and Kirby, M. Neuropsychological assessment of chronic inhalant abusers: A preliminary report. In Sharp, C.W.and Carroll, L.T. eds. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp.111-136.

Blatherwick, C. Understanding glue sniffing. Can J Public Health 63(3):272-276, 1972.

Boeckx, R.; Pstl, B.; and Coodin, F. Gasoline sniffing and tetra-ethyl lead poisoning in children. Pediatrics 60(2):140-145, 1977.

Carlin, A.S.; Detzer, E.; and Strauss, F.F. Psychopathology and non-medical drug use: A comparison of patient and nonpatient drug uses. Int J Addict 12(3):337-348, 1978.

Chavez, E.; Beauvais, F.; and Oetting, E.R. Drug use by small town Mexican American youth: A pilot study. Hispanic J Behav Sci 8(3)243-258, 1986.

Clements, J., and Simpson, R. Environmental and behavioral aspects of glue sniffing in a population of emotionally disturbed adolescents. Int J Addict 13(1):129-134, 1978.

Cohen, S. The volatile solvents. Public Health Rev 2:185-214, 1978.

Cohen, S. Why solvents? In: Sharp, C.W. and Carroll, L.T. eds. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 9 -12.

Comstock, E., and Comstock, B. Medical evaluation if inhalant abusers. In Sharp, C.W., and Brahm, M.L., Review of Inhalants: Euphoria to Dysfunction. National Institute on Drug Abuse, Research Monograph 15. Rockville, Md., 1977. pp. 54- 80.

Comstock, B. Psychological measurements in long-term chronic inhalant abusers. In: Sharp, C.W., and Carroll, L.T., eds. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 159-168.

Coulehan, J.; Hirsch, W.; Brillman, J.; Sanandria, J.; Kelty, T.; Colaiaico, P.; Koros, A.; and Lober, A. Gasoline sniffing and lead toxicity in Navajo adolescents. Pediatrics 71(1):113-117, 1983.

Diagnostic and Statistical Manual of the Mental Disorders, 3d ed. Revised. Washington, D.C.: American Psychiatric Association, 1987.

Ellinson, W. Portrait of a glue sniffer. Crime Delinquency 11(4):394-399, 1964.

Fishburne, P.; Abelson, H.; and Cisin, I. National Survey on Drug Abuse: Main Findings: 1979. Rockville, MD: National Institute on Drug Abuse, 1980.

Fornazzari, L.; Wilkinson, D. Kapur, B.; and Carlen, P. Cerebellar, cortical and functional impairment in toluene abuse. Acta Neurol Scand 67(6):319-329, 1983.

Galli, N. Patterns of student drug use. J Drug Educ 4(2):237-248, 1974.

Gilbert, J. Deliberate metallic paint inhalation and cultural marginality: Paint sniffing among acculturating central California youth. Addict Behav 8:79-82, 1983.

Ginsberg, I.J., and Greenley, J.R. Competing theories of marijuana use: A longitudinal study. J Health Soc Behav 19:22-34, 1978.

Gossett, J.; Lewis, J.; and Phillips, V. Extent and prevalence of illicit drug sue as reported by 56,745 students. JAMA 216:1464-1470, 1971.

Gutierrez, F.; Hernadez, I.; and Rabago, S. Psychological, familial and social study of 32 patients using inhalants. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 75-89.

Harbin, J., and Mazier, H. The families of drug abusers: A literature review. Fam Process 14(3):411-431, 1975.

Johnston, L.; O'Malley, P.; and Bachman, J. Use of Licit and Illicit Drugs by America's High School Students, 1975-1984. Rockville, MD: National Institute on Drug Abuse, 1985.

Johnston, L.; O'Malley, P.; and Bachman, J. Drug Use Among American High School Students, College Students, and Other Young Adults: National Trends through 1985. Rockville, MD: National Institute on Drug Abuse, 1986.

Kandel, D. Reaching the hard to reach: Illicit drug use among high school absentees. Addict Dis 1(4)465-480, 1975.

Kaufman, A. Gasoline sniffing among children in a Pueblo Indian Village. Pediatrics 51:1060-1064, 1972.

Kimlicka, T.M., and Cross, H.J. A comparison of chronic versus casual marijuana uses on personal values and behavioral orientations. Inter J Addict 13(7):1145-1156, 1978.

Korman, M. Clinical evaluation of psychological factors. In: Sharp, C.W. and Brehm, M.L. eds. Review of Inhalants: Euphoria to Dysfunction. National Institute on Drug Abuse Research Monograph 15. Rockville, MD., 1977. pp. 30-53.

Korman, M.; Matthews, R.; and Lovitt, R. Neuropsychological effects of abuse of inhalants. Percept Skills 53:547-553, 1981.

Korman, M.; Trimboli, F.; and Semler, I. A comparative evaluation of 162 inhalant users. Addict Behav. 5:143-152, 1980.

Labouvie, E.W. Alcohol and marijuana use in relation to adolescent stress. Int J Addict 21(3):333-345. 1986.

Leal, H.; Mejia, L.; Gomez, L.; and Salinas de Valle, O. Naturalistic study on the phenomenon of inhalant use in a group of children in Mexico City. In: Sharp, C.W. and Carroll, L.T. eds. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 95-108.

Massengale, O.; Glaser, H.; and LeLievre, R. Physical and psychologic factors in glue sniffing. N Engl J Med 269:1340-1344, 1963.

Medina-Mora, M.; Schnaas, L.; Terroba, G.; Isoard, Y.; and Suarez, C. Epidemiology of inhalant use in Mexico. In: Sharp, C.W. and Carroll, L.T. eds. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978. pp. 15-22.

Mesteth. L. Gas and Glue Sniffing Among the School Age Population. (Pine Ridge Research Bulletin #4.) Washington, D.C.: Supt. of Docs., U.S. Govt. Print Off., 1968.

Moss, A.; Gabow, P.; Kaehny, W.; Goodman, S.; Hunt, L.; and Haussler, M. Faoni's syndrome and distal tublar acidosis after glue sniffing. Ann Intern Med 92(1):69-70, 1980.

Nurco, D.N.; Shaffer, J.W.; and Cison, I.H. An ecological analysis of the interrelationships among drug abuse and other indices of social pathology. Int J Addict 19(4):441-451, 1984.

Nurcombe, B.; Bianchi, G.; Money, J.; and Caute, J. A hunger for stimuli: The psychosocial backgroup of petrol inhalation. Bri J Med Psychol 43:367-374, 1970.

Oetting, E.R., and Beauvais, F. The drug acquisition curve: A method for the analysis and prediction of drug epidemiology. Int J Addict 18(8):1115-1129, 1983.

Oetting, E.R.; Beauvais, F.; Edwards, R.; and Waters, M. The Drug and Alcohol Assessment System: Book II, Instrument Development, Reliability and Validity. Fort Collins, CO: Rocky Mountain Behavioral Science Institute, Inc., 1984.

O'Malley, P.M. Correlates and consequences of illicit drug use. Unpublished Ph.D. thesis, University of Michigan, Ann Arbor, 1975.

Orive, R., and Gerrard, H.B. Personality, attitudinal, and social correlates of drug use. Int J Addict 15(6):869-881, 1980.

Padilla, E.R.; Padilla, A.M.; Morales, A., and Olmedo, E.M. Inhalant, marijuana and alcohol abuse among barrio children and adolescents. Int J Addict 14(7);945-964, 1979.

Press, E., and Done, A. Solvent sniffing. Physiological effects and community control measures for intoxication of organic solvents I. Pediatrics 39(3):451-461, 1967.

Reed, B., and May, P. Inhalant abuse and juvenile delinquency: A control study in Albuquerque, New Mexico. Int J Addict 19(7):789-804, 1984.

Rosenberg, J.; Kasl, S.; and Berberian, R. Sex differences in adolescent drug use: Recent trends. Addict Dis 1(1):73-96, 1974.

Schottstaedt, M., and Bjork, J. Inhalant abuse in an Indian boarding school. Am J Psychiatry 134(11):1290-1293, 1977.

Smart, R.; Fejer, D.; and Alexander, E. Drug Use Among High School Students and Their Parents in Lincoln and Welland Counties. Toronto: Addiction Research Foundation. 1970a.

Smart, R.; Fejer, D.; and White, W. The Extent of Drug Use in Metropolitan Toronto Schools: A Study of Changes From 1968 to 1970. Toronto: Addiction Research Foundation, 1970b.

Stephens, R.; Diamond, S.; Spielman, C.; and Lipton, D. Sniffing from Suffolk to Syracuse: A report of youthful solvent use in New York state. In Sharp, C.W. and Carroll, L.T. eds. Voluntary Inhalation of Industrial Solvents. Rockville, MD: National Institute on Drug Abuse, 1978 pp. 23-40.

Streicher, H.; Gabow, P.; Moss, A,; Kono, D.; and Kaehny, W. Syndromes of toluene sniffing in adults. Ann Inter Med 94:758-762, 1981.

Swaim, R.; Beauvais, F.; Edwards, R.W.; and Oetting, E.R. Adolescent drug use in small rural communities in the Rocky Mountain Region. J Drug Educ 16(1):57-73, 1986.

Torres-Ruiz, A.; Sierra-Espino, B.; Rodriguez-Rocha, F.; and Albera de Ayala, M. Psychopathological manifestations in chronic inhalant abusers. Paper presented at the First International Symposium of the Voluntary Inhalation of Industrial Solvents, Mexico City, 1976.

White, H.R.; Johnson, V.; and Horwitz, A. An application of three deviance theories to adolescent substance use. Int J Addict 21(3):347-366, 1986.

ACKNOWLEDGMENT

Support for this research has been provided by a series of grants from the National Institute on Drug Abuse; the current grant number is DA-03371.

AUTHORS

E.R. Oetting, Ph.D.
Ruth Edwards, M.B.A.
Fred Beauvais, Ph.D.
Psychology Department
Colorado State University
Fort Collins, Colorado 80523

National Institute on Drug Abuse

Research

monograph series

While limited supplies last, single copies of the monographs may be obtained free of charge from the National Clearinghouse for Alcohol and Drug Information (NCADI). Please contact NCADI also for information about availability of coming issues and other publications of the National Institute on Drug Abuse relevant to drug abuse research.

Additional copies may be purchased from the U.S. Government Printing Office (GPO) and/or the National Technical Information Service (NTIS) as indicated. NTIS prices are for paper copy. Microfiche copies, at $6.95, are also available from NTIS. Prices from either source are subject to change.

Addresses are:

NCADI
National Clearinghouse for Alcohol and Drug Information
P.O. Box 2345
Rockville, Maryland 20852

GPO
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

NTIS
National Technical Information Service
U.S. Department of Commerce
Springfield, Virginia 22161

For information on availability of NIDA Research Monographs 1-24 (1975-1979) and others not listed, write to NIDA Office for Research Communications, Room 10A-54, 5600 Fishers Lane, Rockville, MD 20857.

25 BEHAVIORAL ANALYSIS AND TREATMENT OF SUBSTANCE ABUSE. Norman A. Krasnegor, Ph.D., ed.
GPO out of stock
NCADI out of stock
NTIS PB #80-112428 $24.95

26 THE BEHAVIORAL ASPECTS OF SMOKING. Norman A. Krasnegor, Ph.D., ed. (Reprint from 1979 Surgeon General's Report on Smoking and Health.)
GPO out of stock
NTIS PB #80-118755 $18.95

30 THEORIES ON DRUG ABUSE: SELECTED CONTEMPORARY PERSPECTIVES. Dan J. Lettieri, Ph.D.; Mollie Sayers; and Helen W. Pearson, eds.
GPO Stock #017-024-00997-1 $10
NCADI out of stock
Not available from NTIS

31 MARIJUANA RESEARCH FINDINGS: 1980. Robert C. Petersen, Ph.D., ed.
GPO out of stock NTIS PB #80-215171 $24.95

32 GC/MS ASSAYS FOR ABUSED DRUGS IN BODY FLUIDS. Rodger L. Foltz, Ph.D.; Allison F. Fentiman, Jr., Ph.D.; and Ruth B. Foltz.
GPO out of stock NTIS PB #81-133746 $24.95

36 NEW APPROACHES TO TREATMENT OF CHRONIC PAIN: A REVIEW OF MULTIDISCIPLINARY PAIN CLINICS AND PAIN CENTERS. Lorenz K.Y. Ng, M.D., ed.
GPO out of stock NTIS PB #81-240913 $24.95

37 BEHAVIORAL PHARMACOLOGY OF HUMAN DRUG DEPENDENCE. Travis Thompson, Ph.D., and Chris E. Johanson, Ph.D., eds.
NCADI out of stock
GPO out of stock NTIS PB #82-136961 $30.95

38 DRUG ABUSE AND THE AMERICAN ADOLESCENT. Dan J. Lettieri, Ph.D., and Jacqueline P. Ludford, M.S., eds. A RAUS Review Report.
GPO out of stock NCADI out of stock
NTIS PB #82-148198 $18.95

40 ADOLESCENT MARIJUANA ABUSERS AND THEIR FAMILIES. Herbert Hendin, M.D., Ann Pollinger, Ph.D., Richard Ulman, Ph.D., and Arthur Carr, Ph.D.
GPO out of stock NCADI out of stock
NTIS PB #82-133117 $18.95

42 THE ANALYSIS OF CANNABINOIDS IN BIOLOGICAL FLUIDS. Richard L. Hawks, Ph.D., ed.
GPO out of stock NTIS PB #83-136044 $18.95

44 MARIJUANA EFFECTS ON THE ENDOCRINE AND REPRODUCTIVE SYSTEMS. Monique C. Braude, Ph.D., and Jacqueline P. Ludford, M.S., eds. A RAUS Review Report.
GPO out of stock NCADI out of stock
NTIS PB #85-150563/AS $18.95

45 CONTEMPORARY RESEARCH IN PAIN AND ANALGESIA, 1983. Roger M. Brown, Ph.D.; Theodore M. Pinkert, M.D., J.D.; and Jacqueline P. Ludford, M.S., eds. A RAUS Review Report. NCADI out of stock
GPO out of stock NTIS PB #84-184670/AS $13.95

46 BEHAVIORAL INTERVENTION TECHNIQUES IN DRUG ABUSE TREATMENT. John Grabowski, Ph.D.; Maxine L. Stitzer, Ph.D., and Jack E. Henningfield, Ph.D., eds.
NCADI out of stock
GPO out of stock NTIS PB #84-184688/AS $18.95

47 PREVENTING ADOLESCENT DRUG ABUSE: INTERVENTION STRATEGIES. Thomas J. Glynn, Ph.D.; Carl G. Leukefeld, D.S.W.; and Jacqueline P. Ludford, M.S., eds. A RAUS Review Report.
GPO Stock #017-024-01180-1 $5.50 NTIS PB #85-159663/AS $24.95

48 MEASUREMENT IN THE ANALYSIS AND TREATMENT OF SMOKING BEHAVIOR. John Grabowski, Ph.D., and Catherine S. Bell, M.S., eds.
GPO Stock #017-024-01181-9 $4.50 NCADI out of stock
NTIS PB #84-145184/AS $18.95

50 COCAINE: PHARMACOLOGY, EFFECTS, AND TREATMENT OF ABUSE. John Grabowski, Ph.D., ed.
GPO Stock #017-024-01214-9 $4 NTIS PB #85-150381/AS $18.95

51 DRUG ABUSE TREATMENT EVALUATION: STRATEGIES, PROGRESS, AND PROSPECTS. Frank M. Tims, Ph.D., ed.
GPO Stock #017-024-01218-1 $4.50 NTIS PB #85-150365/AS $18.95

52 TESTING DRUGS FOR PHYSICAL DEPENDENCE POTENTIAL AND ABUSE LIABILITY. Joseph V. Brady, Ph.D., and Scott E. Lukas, Ph.D., eds.
GPO Stock #017-024-01204-1 $4.25 NTIS PB #85-150373/AS $18.95

53 PHARMACOLOGICAL ADJUNCTS IN SMOKING CESSATION. John Grabowski, Ph.D., and Sharon M. Hall, Ph.D., eds.
GPO Stock #017-024-01266-1 $3.50 NCADI out of stock

54 MECHANISMS OF TOLERANCE AND DEPENDENCE. Charles Wm. Sharp, Ph.D., ed.
GPO out of stock

56 ETIOLOGY OF DRUG ABUSE: IMPLICATIONS FOR PREVENTION. Coryl LaRue Jones, Ph.D., and Robert J. Battjes, D.S.W., eds.
GPO Stock #017-024-01250-5 $6.50

57 SELF-REPORT METHODS OF ESTIMATING DRUG USE: MEETING CURRENT CHALLENGES TO VALIDITY. Beatrice A. Rouse, Ph.D., Nicholas J. Kozel, M.S., and Louise G. Richards, Ph.D., eds.
GPO Stock #017-024-01246-7 $4.25

58 PROGRESS IN THE DEVELOPMENT OF COST-EFFECTIVE TREATMENT FOR DRUG ABUSERS. Rebecca S. Ashery, D.S.W., ed.
GPO Stock #017-024-01247-5 $4.25

59 CURRENT RESEARCH ON THE CONSEQUENCES OF MATERNAL DRUG ABUSE. Theodore M. Pinkert, M.D., J.D., ed.
GPO Stock #017-024-01249-1 $2.50

60 PRENATAL DRUG EXPOSURE: KINETICS AND DYNAMICS. C. Nora Chiang, Ph.D., and Charles C. Lee, Ph.D., eds.
GPO Stock #017-024-01257-2 $3.50

61 COCAINE USE IN AMERICA: EPIDEMIOLOGIC AND CLINICAL PERSPECTIVES. Nicholas J. Kozel, M.S., and Edgar H. Adams, M.S., eds.
GPO Stock #017-024-01258-1 $5

62 NEUROSCIENCE METHODS IN DRUG ABUSE RESEARCH. Roger M. Brown, Ph.D., and David P. Friedman, Ph.D., eds.
GPO Stock #017-024-01260-2 $3.50

63 PREVENTION RESEARCH: DETERRING DRUG ABUSE AMONG CHILDREN AND ADOLESCENTS. Catherine S. Bell, M.S., and Robert J. Battjes, D.S.W., eds.
GPO Stock #017-024-01263-7 $5.50

64 PHENCYCLIDINE: AN UPDATE. Doris H. Clouet, Ph.D., ed.
GPO Stock #017-024-01281-5 $6.50

65 WOMEN AND DRUGS: A NEW ERA FOR RESEARCH. Barbara A. Ray, Ph.D., and Monique C. Braude, Ph.D., eds.
GPO Stock #017-024-01283-1 $3.25

66 GENETIC AND BIOLOGICAL MARKERS IN DRUG ABUSE AND ALCOHOLISM. Monique C. Braude, Ph.D., and Helen M. Chao, Ph.D. eds.
GPO Stock #017-024-01291-2 $3.50 NCADI out of stock

68 STRATEGIES FOR RESEARCH ON THE INTERACTIONS OF DRUGS OF ABUSE. Monique C. Braude, Ph.D., and Harold M. Ginzburg, M.D.,J.D.,M.P.H., eds.
GPO Stock #017-024-01296-3 $6.50

69 OPIOID PEPTIDES: MEDICINAL CHEMISTRY. Rao S. Rapaka, Ph.D.; Gene Barnett, Ph.D.; and Richard L. Hawks, Ph.D., eds.
GPO Stock #017-024-1297-1 $11

70 OPIOID PEPTIDES: MOLECULAR PHARMACOLOGY, BIOSYNTHESIS, AND ANALYSIS. Rao S. Rapaka, Ph.D., and Richard L. Hawks, Ph.D., eds.
GPO Stock #017-024-1298-0 $12

71 OPIATE RECEPTOR SUBTYPES AND BRAIN FUNCTION. Roger M. Brown, Ph.D.; Doris H. Clouet, Ph.D.; and David P. Friedman, Ph.D., eds.
GPO Stock #017-024-01303-0 $6

72 RELAPSE AND RECOVERY IN DRUG ABUSE. Frank M. Tims, Ph.D., and Carl G. Leukefeld, D.S.W., eds.
GPO Stock #017-024-01302-1 $6

73 URINE TESTING FOR DRUGS OF ABUSE. Richard L. Hawks, Ph.D., and C. Nora Chiang, Ph.D., eds.
GPO Stock #017-024-1313-7 $3.75

74 NEUROBIOLOGY OF BEHAVIORAL CONTROL IN DRUG ABUSE. Stephen I. Szara, M.D., D.Sc., ed.
GPO Stock #017-024-1314-5 $3.75

75 PROGRESS IN OPIOID RESEARCH. PROCEEDINGS OF THE 1986 INTERNATIONAL NARCOTICS RESEARCH CONFERENCE. John W. Holaday, Ph.D.; Ping-Yee Law, Ph.D.; and Albert Herz, M.D., eds.
GPO Stock #017-024-01315-3 $21

76 PROBLEMS OF DRUG DEPENDENCE, 1986. PROCEEDINGS OF THE 48TH ANNUAL SCIENTIFIC MEETING, THE COMMITTEE ON PROBLEMS OF DRUG DEPENDENCE, INC. Louis S. Harris, Ph.D., ed.
GPO Stock #017-024-1316-1 $16 NTIS PB #88-208111/AS $44.95

77 ADOLESCENT DRUG ABUSE: ANALYSES OF TREATMENT RESEARCH. Elizabeth R. Rahdert, Ph.D., and John Grabowski, Ph.D., eds.
GPO Stock #017-024-1348-0 $4

78 THE ROLE OF NEUROPLASTICITY IN THE RESPONSE TO DRUGS David P. Friedman, Ph.D., and Doris H. Clouet, Ph.D., eds.
GPO Stock #017-024-01330-7 $6

79 STRUCTURE-ACTIVITY RELATIONSHIPS OF THE CANNABINOIDS Rao S. Rapaka, Ph.D., and Alexandros Makriyannis, Ph.D., eds.
GPO Stock #017-024-01331-5 $6

80 NEEDLE-SHARING AMONG INTRAVENOUS DRUG ABUSERS: NATIONAL AND INTERNATIONAL PERSPECTIVES. Robert J. Battjes, D.S.W., and Roy W. Pickens, Ph.D., eds.
GPO Stock #017-024-01345-5 $5.50 NTIS PB #88-236138/AS $25.95

81 PROBLEMS OF DRUG DEPENDENCE, 1987. PROCEEDINGS OF THE 49TH ANNUAL SCIENTIFIC MEETING, THE COMMITTEE ON PROBLEMS OF DRUG DEPENDENCE, INC. Louis S. Harris, Ph.D., ed.
GPO Stock #017-024-01354-4 $17

82 OPIOIDS IN THE HIPPOCAMPUS. Jacqueline F. McGinty, Ph.D., and David P. Friedman, Ph.D. eds.
GPO Stock #017-024-01344-7 $4.25

83 HEALTH HAZARDS OF NITRITE INHALANTS. Harry W. Haverkos, M.D., and John A. Dougherty, Ph.D., eds.
GPO Stock #017-024-01351-0 $3.25

84 LEARNING FACTORS IN SUBSTANCE ABUSE. Barbara A. Ray, Ph.D., ed.
GPO Stock #017-024-01353-6 $6

86 COMPULSORY TREATMENT OF DRUG ABUSE: RESEARCH AND CLINICAL PRACTICE. Carl G. Leukefeld, D.S.W., and Frank M. Tims, Ph.D., eds.
GPO Stock #017-024-01352-8 $7.50

IN PRESS

88 MECHANISMS OF COCAINE ABUSE AND TOXICITY. Doris H. Clouet, Ph.D., Khursheed Asghar, Ph.D., and Roger M. Brown, Ph.D., eds.

89 BIOLOGICAL VULNERABILITY TO DRUG ABUSE. Roy W. Pickens, Ph.D., and Dace S. Svikis, B.A., eds.

DHHS Publication No. (ADM) 88-1577
Alcohol, Drug Abuse, and Mental Health Administration
Printed 1988